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AUTOMOTIVE INDUSTRIES

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VOL. L

NEW YORK—THURSDAY, MARCH 13, 1924

No. 11

Percentages Are Safest Guides for Automotive Prophets

Despite major fluctuations in production, registrations, and number of dealers, proportion of each divided among States and price classes changes slowly.

By Norman G. Shidle

THE year 1923 was a bad one for the automotive prophets. All guesses on production and registration missed fire by a considerable margin and even the most acute observers were astounded by the records made. Only three years ago, moreover, the automotive Cassandras had just as bad luck as in 1923, the only difference being that the 1920 guesses were far too optimistic, while those of last year were too conservative.

Thus far the automotive industry has been the unruly child of the business trend family. Nobody paid much attention to it as an infant because it wasn't strong enough to affect the prosperity of its big brothers very much one way or the other. In early youth, however, it got into the limelight by chasing horses off the highways, and before it was well along in its 'teens it had grown so big that the whole brotherhood of industries had to take its actions into account.

Now in the full bloom of its young manhood, the automotive industry gives employment to so many thousands of persons, buys so many millions of dollars' worth of goods and affects so vitally the prosperity of every other industry, that economists and business men are staying up nights in an attempt to find out what it is likely to do next.

SO far they have been only reasonably successful.

Every time they have gotten a predicting mechanism functioning properly, a boom or depression has come along and thrown sand in the gearbox. Then with highly commendable energy and determination they have started all over again to redesign the ma-

chinery for finding the secret of automotive economic movements.

Despite some major reverses, however, the automotive economists have won some minor victories of importance in the last few years. Through the work of men in various automobile and parts companies, the task of buying, manufacturing and marketing is being carried on more economically than ever before. Careful study of past performances and trends has made it possible to conduct current activities on a more efficient basis.

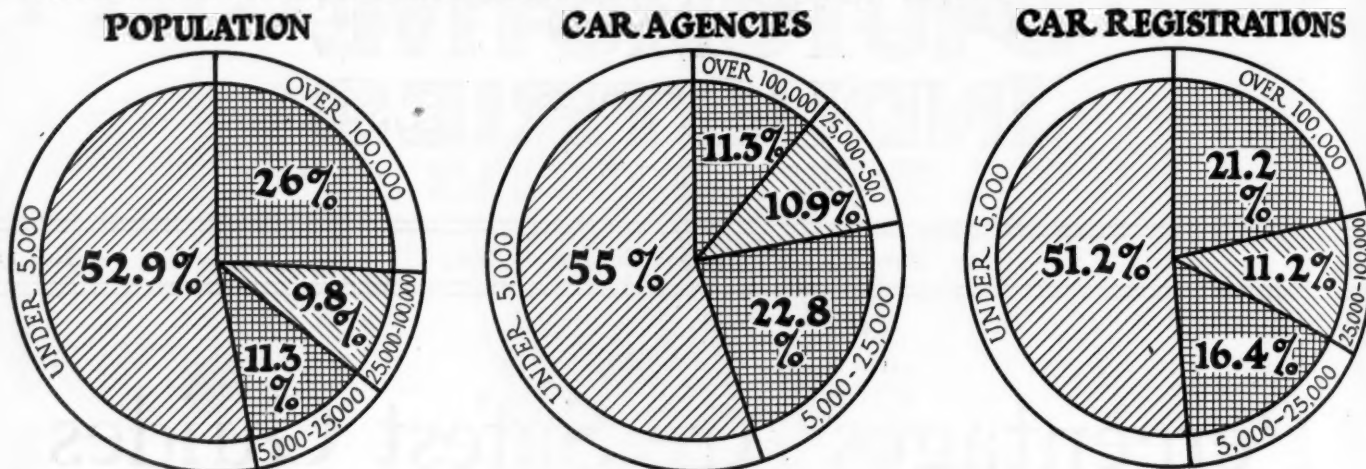
A MASTER key has not been found to open the door which will reveal the economic future of the automotive industry, but consistent study has enlarged the keyhole sufficiently to permit some very clear views of parts of that panorama. Probably a master key never will be found. More than likely it will be necessary to keep on enlarging the keyhole, bit by bit, until the door itself is cut away. At any rate, it would be presumptuous to claim that present knowledge or any specific method already available will meet all conditions.

A careful survey of past data about the industry does show that the automotive executive has one very powerful ally in his attempt to distribute his dealers properly, to set sales quotas fairly and to adjust production to the needs of his distributing organization.

That ally is Percentage.

Treated properly, Percentage will guide the executive safely through many tangled economic paths. Improperly treated, it becomes a treacherous leader.

POPULATION, CAR AGENCIES AND REGISTRATIONS IN TOWNS OF VARIOUS SIZES AS OF JAN. 1924



It must be supplemented with current figures of actual production, registrations and number of dealers, but when applied to these current data in a common-sense manner it becomes an invaluable aid. Most sales planning is for short periods ahead and it is in this work that percentages are of special importance.

A few specific examples, based on actual statistical studies, will show clearly how percentages can be used to practical advantage in marketing work, bearing in mind the fact that the individual executive is interested chiefly in interpreting general figures in terms of his own company.

While motor vehicle registrations climbed from a little over 1,000,000 in 1912 to well over 15,000,000 in 1923, the percentage of registrations in each State has remained fairly constant throughout that period. Michigan, for example, had 3.9 per cent of all the cars registered in 1912 and it had 4.8 per cent in 1923. During the ten years Michigan's percentage of the total never went below 3.9 nor above 4.9; the variation during the entire period was plus or minus .5 of one per cent.

The proportion in Ohio during this time varied only from 6.2 to 7.3; in Iowa from 3.8 to 5.8; in Wisconsin from 2.2 to 3.3; in New York from 8.0 to 10.8; in Alabama from .3 to .9 and so on down the line. The variation from year to year, of course, has been even smaller than that for the period as a whole.

State Registration Proportions

In a general way, then, it is fairly safe to predict the percentage of total registrations which will be found in any given State for the coming year and on this assumption to proportion such distribution as properly may depend on registrations. This is quite different than predicting the actual number of registrations. Where such a figure is necessary, the proportion of output for each State can be determined at the beginning of the year and then applied to new car sales figures collected from month to month.

The same stability of percentages is found in connection with the distribution of dealers. While the actual number of dealers has gone up considerably in recent years, the proportion of car agencies found in towns of various sizes remains almost the same from year to year. This is shown by the following table:

Population:	Under 5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	Over 100,000
1921	60.7	9.7	11.4	6.2	3.5	8.5
1922	55.9	10.7	11.3	6.6	4.9	10.6
1923	54.4	10.8	11.8	6.8	4.9	11.3
1924	55.0	11.1	11.7	6.0	4.9	11.3

Even a very detailed analysis of the dealer figures fails to shake the percentage equilibrium. When the dealers are further subdivided according to the price class of the car which they handle, the proportion in towns of various sizes remains relatively constant from year to year within a given group. Distribution of car agencies handling cars which sell for less than \$500, for example, shows the following slight variations over a period of four years:

Population:	Under 5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	Over 100,000
1921	75.5	7.8	7.2	3.0	1.5	5.0
1922	73.2	8.1	6.7	3.1	2.2	6.7
1923	71.7	8.1	6.8	3.4	2.3	7.7
1924	72.8	8.2	6.6	2.8	2.2	7.4

Car Agency Distribution

The following figures tell the story for agencies selling cars in the \$1,000-\$2,000 price class:

Population:	Under 5,000	5,000-10,000	10,000-25,000	25,000-50,000	50,000-100,000	Over 100,000
1921	52.1	10.9	13.7	7.6	5.4	10.3
1922	48.2	12.6	13.7	8.2	5.8	11.5
1923	47.3	12.6	14.4	8.2	5.7	11.8
1924	47.3	12.7	14.6	7.6	5.5	12.3

Data for other price classes show a similar degree of stability for percentages within the group.

The percentage of total car registrations in each price class has not changed radically for some years. In 1922, about 73 per cent of the cars in operation were in the "under \$1,000" price group; in 1921 the percentage was about 69; in 1923 about 74.

Registrations in the \$1,000-\$2,000 price class were about 23 per cent in 1923, 1922 and 1921. The percentage in the "over \$3,000" group has varied less than one per cent in five years.

Population Ratios Steady

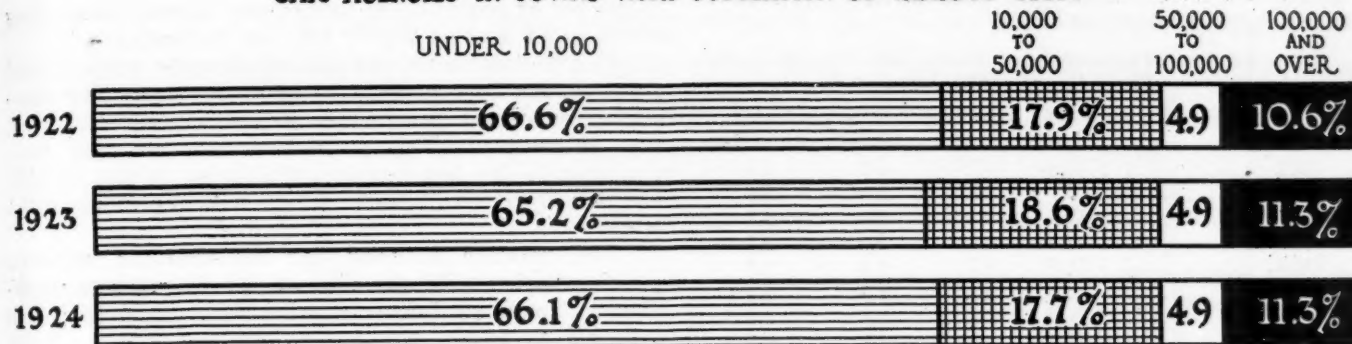
Lack of radical change appears also in the percentage of population in towns of various sizes from year to year. The following distribution based on the most recent census figures can be applied to any recent year with approximate accuracy:

	Per Cent of Population
Under 5,000	52.9
5,000-10,000	4.7
10,000-25,000	6.6
25,000-50,000	4.8
50,000-100,000	5.0
Over 100,000	26.0

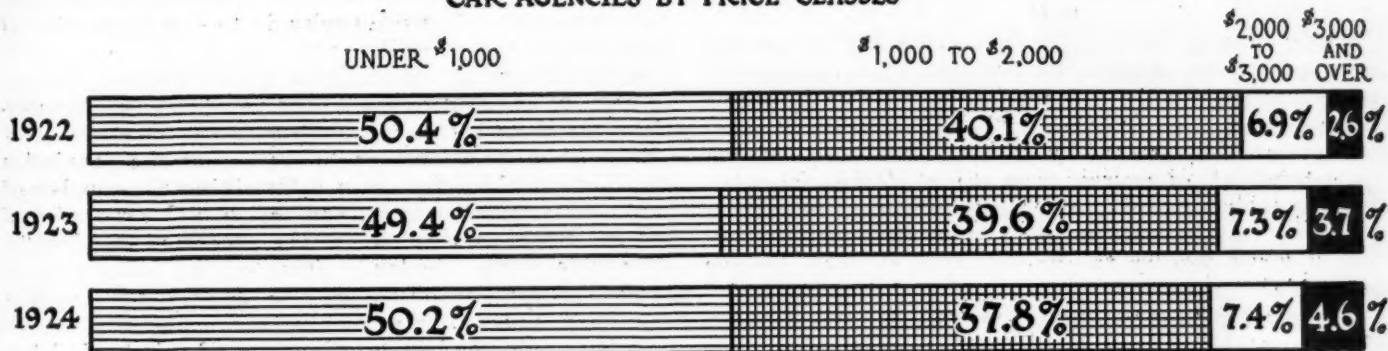
Percentage Change in Automotive Activities Is Relatively Slow

The relative stability of the percentages shown in the following charts makes them particularly useful in laying out marketing plans for the future:

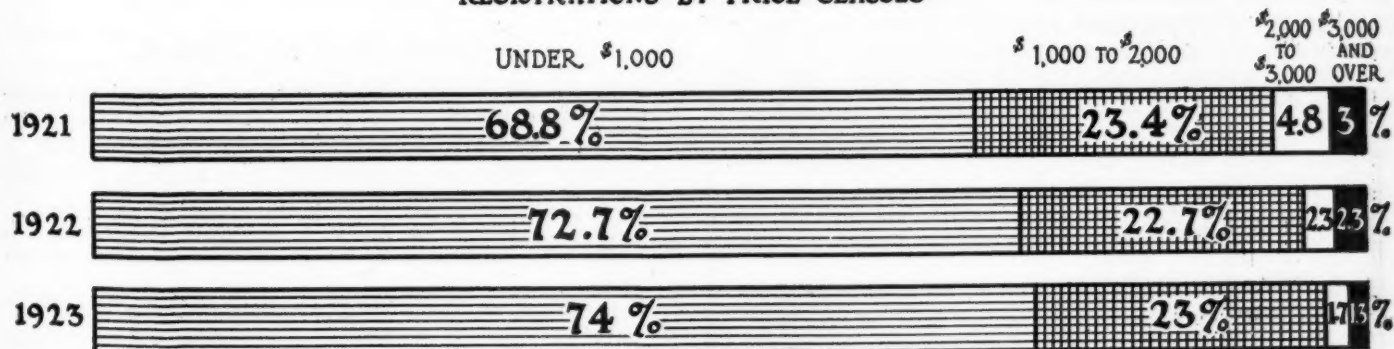
CAR AGENCIES IN TOWNS WITH POPULATION OF VARIOUS SIZES



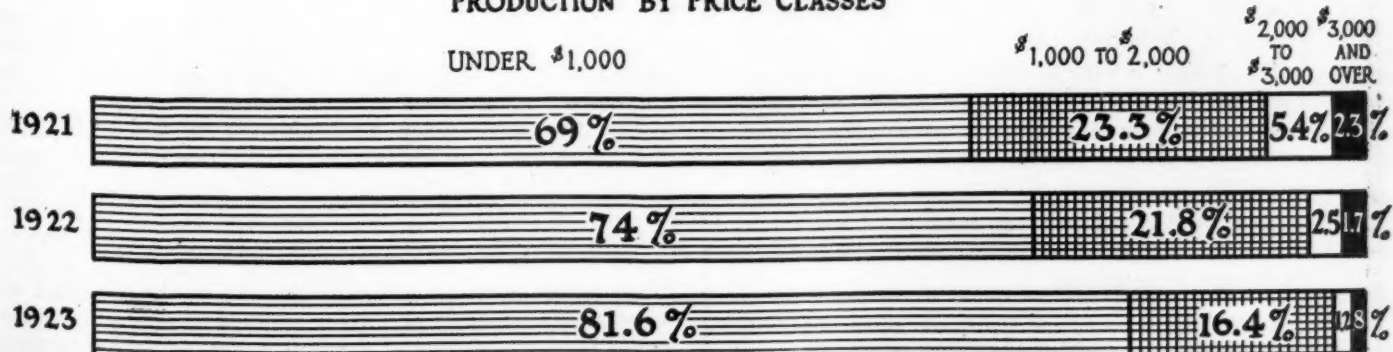
CAR AGENCIES BY PRICE CLASSES



REGISTRATIONS BY PRICE CLASSES



PRODUCTION BY PRICE CLASSES



Even in production, by far the most variable feature of automotive activity, the proportion of total output found in the different price classes does not change radically from year to year, although the variations are greater than in other relationships. The differences in percentage run as high as 20 per cent in the lower priced group when a decade is considered, but the year to year changes usually are much smaller. The production percentages, studied over a period of ten years, indicate a definite trend, as well as provide relatively stable units of measurement for short time calculations. This fact is shown by the following table:

PERCENTAGE OF PRODUCTION OF PASSENGER CARS IN EACH PRICE CLASS (1912-1923)

Years	Under \$1,000	\$1,000-\$2,000	\$2,000-\$3,000	\$3,000 and Over
1912	43.8	47.7	2.9	5.6
1913	62.7	28.5	5.0	3.8
1914	62.5	29.5	5.5	2.5
1915	72.3	24.4	2.2	1.1
1916	81.3	15.5	2.4	0.8
1917	79.8	17.5	1.5	1.2
1918	71.6	24.2	3.4	0.8
1919	58.9	34.9	4.2	2.0
1920	59.4	32.9	4.3	3.4
1921	69.0	23.3	5.4	2.3
1922	74.0	21.8	2.5	1.7
1923	81.6	16.4	1.2	0.8

Thus, even in the rapidly changing trend of production, very large changes do not take place over short periods of time in the production comprised in a specific price class.

Certain facts desired in making sales plans cannot be determined, of course, from a use of these percentages in their simplest form, but a good deal of routine planning can be accomplished by applying the established trend figures to current data as they become available.

For more detailed studies, however, it may be necessary to establish the relationship between various sets of percentages. Even this process need not be particularly complicated in its actual operation, but combinations of percentages must be made very carefully and with full realization that the figures involved already are expressive of relative conditions.

The following comparison of percentages will serve to illustrate the point involved and also to present some

interesting data recently compiled by AUTOMOTIVE INDUSTRIES.

PERCENTAGES OF POPULATION, CAR AGENCIES AND REGISTRATIONS IN TOWNS OF VARIOUS SIZES

	Population	Car Agencies	Registrations
Under 5,000	52.9	55.0	51.2
5,000-25,000	11.3	22.8	16.4
25,000-100,000	9.8	10.9	11.2
100,000 and over ..	26.0	11.3	21.2

This set of percentages brings out several interesting points, chief among which are the following:→

1. Car registrations are almost directly proportional to population in communities of every size. The relation between these two factors may be expressed as 1 : 1, taken in general. This proportion does not hold true, of course, to the last degree but applied in any specific case it will give an answer which will approximate the facts.

2. The relation between car registrations and car agencies varies with the size of the towns being considered. In small towns, rural districts and in towns of 25,000 to 50,000 population, the percentage of car dealers is about the same as the percentage of car registrations.

3. In towns of 5,000 to 25,000 population, however, the proportion of car agencies is to the proportion of registrations about as $1\frac{1}{2}$: 1.

4. In cities with a population of over 100,000, the percentage of car agencies is to the percentage of registrations about as 1 : 2.

The latter relationships indicate that the population itself is the chief factor in determining the number of cars sold in rural sections, and that a high proportion of the dealers are needed to get the necessary distribution over wide areas. In large cities, on the other hand, a much smaller percentage of the dealers can reach a relatively larger number of buyers.

It is easy to see how relationships of this kind, determined to be approximately correct in general, can be applied to the specific problems and data of a particular organization.

Estimates Must Be Qualified

Perhaps the worst mistake automotive prophets sometimes have made in the past has been to make predictions without sufficiently qualifying them. Consequently, a good many "advance statements" have come to be looked upon with a bit of skepticism.

This is unfortunate, since it is highly important that the effort be continued to study automotive trends scientifically.

Predictions of some kind, whether they be "hunches" or carefully worked out analyses, are essential in running any business. The executive must estimate future probabilities on some basis.

Statistical methods and studies have made possible more accurate estimates than were available in past years, but perfection has not yet been reached. Each prediction should be given and used with a full understanding of the variables involved.

The examples given are sufficient to illustrate both the value and the limitations of the use of percentages in automotive planning. It would be foolish to work on the assumption that the percentages are entirely stable; that they do not change at all. They do change; quite a little in certain instances. The point is that they rarely change radically within a short period of time and that they are safer guides to action in many cases than are estimates made in terms of actual figures.

In Next Week's Issue—

JAMES DALTON shows what the 1923 production figures mean to car manufacturers, large and small. Increased concentration of output in the lowest price class and in the hands of relatively few companies has caused many new questions to be raised in the minds of executives.

Mr. Dalton's article indicates a bright future for the smaller as well as the larger companies provided certain merchandising fundamentals are carried out in 1924 selling activities.

The striking facts brought out in this analysis will be of major interest to manufacturing executives.

Merits of Four-Wheel Brakes Proved Before S. A. E. Members

Cars so equipped make average stops of 21.1 ft. from 20 m.p.h., while others require 36 ft. in instructive demonstration staged by Washington Section of Society in cooperation with Bureau of Standards. W. S. James presents more data on friction coefficients.

By Herbert Chase

BRAKING on four wheels conclusively proved its advantages from the standpoint of rapid deceleration in tests staged in Washington last week by the Washington Section of the Society of Automotive Engineers working in cooperation with the Bureau of Standards. Of the fourteen cars which participated in these tests, ten had four-wheel brakes and the remainder two-wheel brakes only. Tests were made at 20 and 30 miles per hour on dry asphalt paving, and at 25 m.p.h. on the same surface washed clean and still wet.

In the tests on dry pavement, the four-wheel brake cars showed an average deceleration rate of 20.9 ft. per sec. per sec. as against 11.1 per sec. per sec. for two-wheel brake cars. On wet pavement the corresponding figures were respectively 17.5 and 8.2 per sec. per sec.

Expressed in terms of equivalent stopping distance from an initial speed of 20 m.p.h. the average figure for four-wheel brake cars on dry pavement was 21.1 ft. and on wet pavement, 26.8 ft. Corresponding figures for two-wheel brake cars were 36 and 53.3 ft. respectively.

Such figures for individual cars would mean, but little unless great care were taken to make the conditions truly comparable, but in this case, with so many cars involved and the tests conducted by experienced observers using the best equipment available for measuring deceleration, it is impossible to escape the conclusion that the four-wheel brake jobs conclusively proved their better braking qualities.

Performance of Two-Wheel Brake Cars

It is interesting to note from the accompanying Table I in which the results are set forth that the best performance of the cars with two-wheel brakes, which, by the way, is quite creditable as a two-wheel brake performance, was not quite equal to the poorest showing of the four-wheel brake jobs. In both classes, however, there was a considerable difference as between different makes of cars. For example, one four-wheel brake car made a stop equivalent to 14 ft. from a speed of 20 m.p.h., while another car with similar brake equipment required nearly three times this distance, with others scattering between these limits.

It should be pointed out that, while the average figures here given are reasonably comparable, discretion must be used in comparing individual figures for the reason that the drivers probably were not equally skillful and that the brakes more than likely were not adjusted with the same nicety in each case.

It was hoped that the tests would afford some comparison as between balloon tires and regular cord tires in respect to their effect upon braking, but this proved to be the case only to a quite limited extent. On the four-

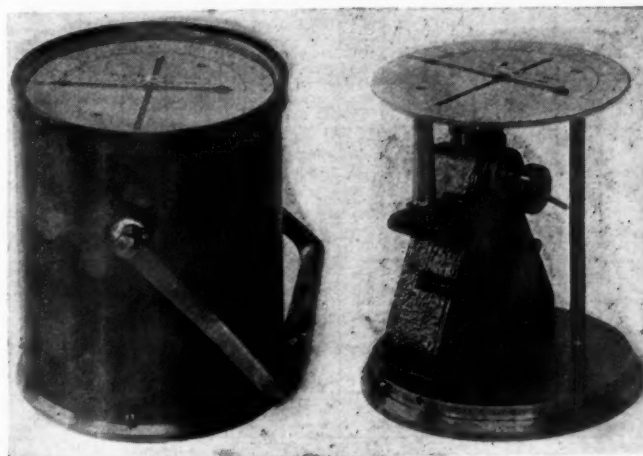
wheel brake cars there was but little to choose, so far as the effect of tire equipment can be differentiated from other variables, as between balloon and regular cord tire equipment, although the balloon tired cars showed a slightly better average braking ability. On the cars with two-wheel brakes the reverse was true.

Friction Coefficient Between Tire and Road

Bureau of Standards representatives who have been studying the coefficient of friction between tire and road have not as yet been able to make a direct and conclusive comparison between balloon and other tires in this respect, but from such data as is in hand they are inclined to the belief that there is reason to doubt claims which are made for better traction and braking with balloon tires, at least on hard smooth surfaced roads.

Before giving further details concerning the foregoing tests data secured by the Bureau of Standards and presented by W. S. James, at the Washington section meeting, which followed the demonstration will be considered. Some of this data has been summarized in these columns, especially in an article describing the recording decelerometer which was developed at the Bureau and which has since been employed in many other tests besides those made last week. (See AUTOMOBILE INDUSTRIES for Nov. 29, 1923, p. 1091.)

An indication of the relative effectiveness of what may be considered the average run of brakes to be found on cars on the road in this country today is given in Table II. These cars were selected at random and were sub-



Two views of the indicating decelerometer developed by the Bureau of Standards for use of police authorities in brake inspection

Table I
Cars with Four-wheel Brakes

Car	Pave- ment	Approx. Speed, m.p.h.	Distance, Line to Stop, Ft.	Decel- erometer Reading, Ft. per Sec. ²	Equivalent Distance to Stop from 20 m.p.h., Ft.	Tire Equipment
A	Dry	20	26.4	27.0	16	5.25/21 balloon
	Dry	30	44.3	27.0	16	
	Wet	25	40.6	30.8	14	
B	Dry	20	32.4	21.6	20	6.20/20 balloon
	Dry	30	62.0	16.6	26	
	Wet	25	59.0	14.4	30	
C	Dry	20	31.5	21.6	20	5.25/21 balloon
	Dry	30	55.0	22.7	19	
	Wet	25	41.9	21.6	20	
D	Dry	20	40.9	16.6	26	20 x 4½
	Dry	30	60.0	18.0	24	
	Wet	25	49.5	17.3	25	
E	Dry	20	46.3	24.0	18	31 x 4
	Dry	28	49.9	21.6	20	
	Wet	25	50.1	21.6	20	
F	Dry	20	25.2	21.6	20	32 x 4½
	Dry	30	55.0	24.0	18	
	Wet	25	37.6	16.6	26	
G	Dry	20	41.3	16.6	26	33 x 5
	Dry	21	43.6	17.3	25	
	Wet	25	95.0	14.4	30	

Car	Pave- ment	Approx. Speed, m.p.h.	Distance, Line to Stop, Ft.	Decel- erometer Reading, Ft. per Sec. ²	Equivalent Distance to Stop from 20 m.p.h., Ft.	Tire Equipment
H	Dry	24	42.9	16.6	26	32 x 4
	Dry	32	78.6	18.0	24	
	Wet	25	66.1	12.3	35	
I	Dry	20	38.4	20.6	21
	Dry	30	72.0	21.6	20	
	Wet	25	81.2	10.8	40	
J	Dry	20	30.8	33 x 5
	Dry	30	36.8	24.0	18	
	Wet	25	15.4	28	

Car	Pave- ment	Approx. Speed, m.p.h.	Distance, Line to Stop, Ft.	Decel- erometer Reading, Ft. per Sec. ²	Equivalent Distance to Stop from 20 m.p.h., Ft.	Tire Equipment
K	Dry	20	59.4	14.4	30	33 x 4½
	Dry	30	105.8	12.3	35	
	Wet	25	135.6	7.2	60	
L	Dry	17	37.6	14.4	30	33 x 5
	Dry	32	73.7	12.3	35	
	Wet	25	67.1	9.6	45	
M	Dry	20	45.5	10.8	40	5.25/20 balloon
	Dry	30	103.0	9.0	48	
	Wet	25	96.7	7.9	55	
N	Dry	20	27.6	12.3	35	5.25 balloon
	Dry	30	67.3	12.3	35	
	Wet	25	99.0	

jected to test on the same stretch of concrete road without making any adjustments on the brakes. Measurements were made with the Bureau of Standards recording decelerometer. It will be seen that the distance required

to stop from 20 m.p.h. varied from 22 to 98 ft., using service brake only and from 42 to 155 ft., using the so-called "emergency" or hand brake only. The average in the two cases was respectively 53 and 84 ft. From this it is apparent that the average hand brake is only a little more than one-half as effective as the service or foot brake, and that there is a very decided difference between the effectiveness of brakes on different cars.

The last mentioned fact is not at all surprising to those who have taken the trouble to make observations in this connection, but does serve to show in a concrete way how necessary it is to have ordinances governing the effectiveness of brakes if reasonable safety is to be assured.

A number of municipal authorities already are inspecting brake equipment, although their methods of measuring brake effectiveness are of somewhat doubtful value. Because of this fact the Bureau of Standards has developed a simple form of indicating decelerometer, views of which are given in the accompanying cut. In this instrument the deflection of a pendulum mounted on a horizontal shaft is used as the means for measuring the rate of deceleration or the number of feet required to make a stop from a speed of 20 m.p.h.

A bevel gear seen in the accompanying cut is mounted on the pendulum shaft and is arranged to mesh with a pinion giving a 4 to 1 ratio. On the pinion shaft is mounted the recording hand which moves over a scale extending about half way around the dial.

The pendulum is damped by a vane which is submerged in oil contained in the closed triangular chamber seen in the cut. This vane is counter-weighted by the adjustable bob shown adjacent to the gear. Police officials who have observed this instrument in use have expressed satisfaction with its performance and readily appreciate its superiority over the ordinary method of testing in which the driver is required to approach a line on the road at a given speed and apply the brakes when the car crossed the line.

The accuracy of the latter method depends upon having

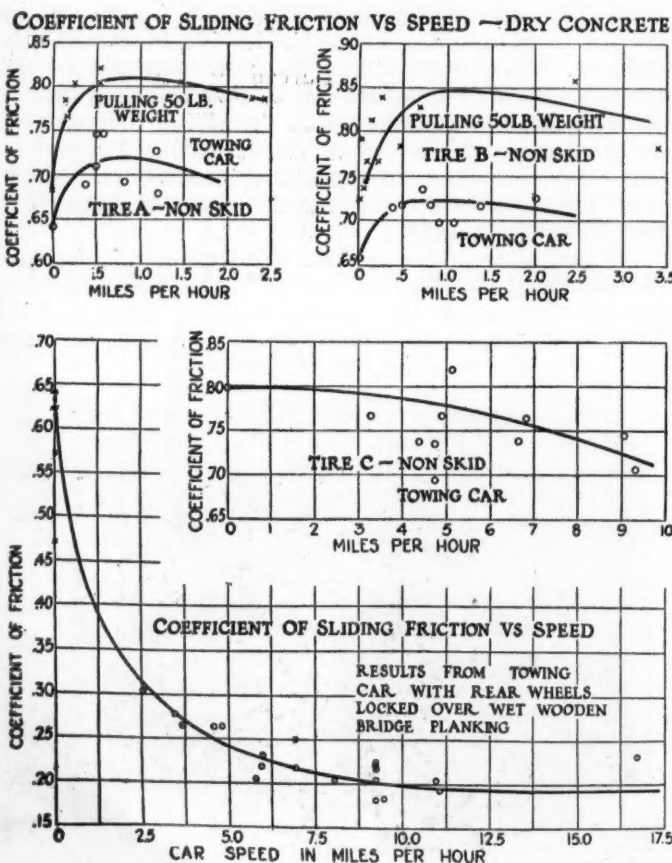


Fig. 1—Curves showing variation in coefficient of friction between tires and various road surfaces

a reliable speedometer and upon ability of the driver to apply the brakes exactly at the moment the car crosses the line. Often he misses the line by several feet, sometimes applying the brakes too soon and sometimes too late with the result that a measurement of the distance from the line to the point at which the car comes to rest may be either too great or too little.

Use of the indicating decelerometer described above avoids both of these difficulties, since its reading is practically independent of speed of the vehicle when the brakes are applied, and since it is not necessary to apply the brakes at any particular point on the test course.

The Bureau of Standards has made certain tests, results of which are given in Table III, which enable a comparison of decelerometer readings with deceleration rates obtained by measurements of the initial car speed and the distance required to stop from a given point. The upper half of this table shows that quite a variety of results are obtained even with an accurate speedometer when distance to stop alone is measured, whereas when the decelerometer is employed there is but little variation in the instrument's readings.

The lower half of Table III shows how accurate are the decelerometer measurements. In this case the instrument is checked against distance from a mark on the road made by firing automatically at the instant the brake is applied a revolver interconnected with the brake mechanism. It will be seen that the instrument reading varies on an average of about 1 per cent from the distance measured from the spot on the road made by discharging the revolver.

Table IV gives a record of the time required with various cars and various drivers to apply the brake after a signal to stop has been given. It will be seen that the average time amounts to 0.42 sec. in the case of the foot brake and 0.51 average in the case of the hand brake.

While these are short times, they make a considerable difference in stopping distance, since when a car is traveling at only 20 m.p.h. it is moving at the rate of nearly 30 ft. per sec. Usually it will travel some 15 ft. after a signal to stop is given and the operator starts to apply the brakes. This again illustrates the need for using a decelerometer in place of the line crossing methods ordinarily employed for police tests of brakes.

Former Test Published

In AUTOMOTIVE INDUSTRIES for November 29, 1923, various values of coefficients of friction between tire tread and road surfaces at slow speeds as obtained by the Bureau of Standards were given. The coefficients were obtained by dragging a section of tire loaded with a certain weight over various surfaces and measuring the ratio of pull required to the weight on the surface. In the table given at that time the weight employed was about 50 lb. and the speeds were very low. Also the weight was a block of iron resting in a section of the tire which, of course, was not inflated.

Further tests since have been made by towing a car with its wheels locked over a given surface at different speeds. In this case sections of tire to be tested were wired onto the casings of the locked wheels in such a position as to remain in place between the tire and the road surface. The coefficient of friction measured by this method in comparison with those formerly obtained are given in the curves in Fig. 1. From these it will be noted that the coefficients are somewhat lower than those obtained by the first method, but that the curve plotted between speed and coefficient of friction has approximately the same shape as that first obtained. In most cases the starting friction or "friction of rest" is lower than the friction of motion.

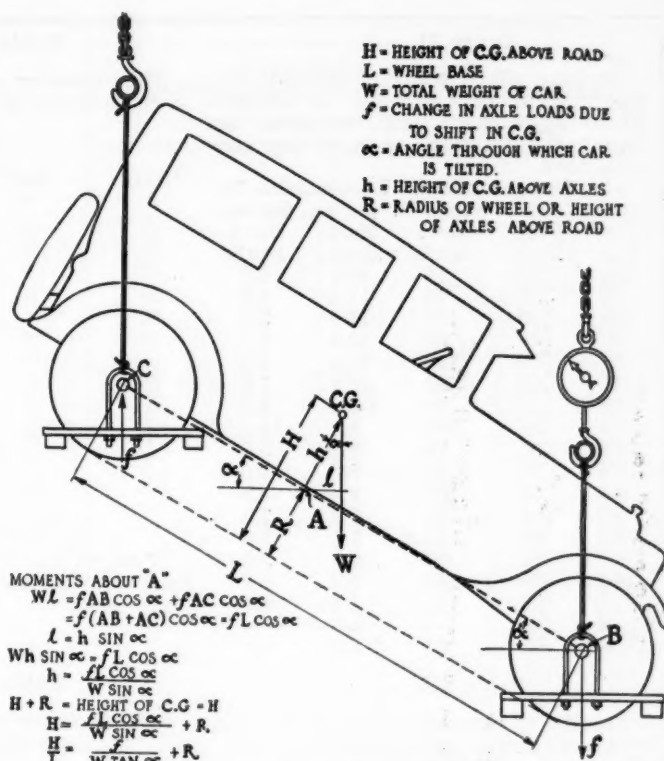


Fig. 2—Diagram of apparatus used and formulas employed in determining height of center of gravity of a car

One of the curves shows the variation in coefficient of friction between tires and the wet wooden planking of a bridge. In this case it will be noted that the coefficient falls off rapidly from the value 0.64 to a value of about 0.2 with an increased speed of only 5 m.p.h.

Table V gives several values of what is termed the "coefficient of traction" or the ratio of the retarding force to the weight on the braked wheels of the car. These values were obtained from decelerometer readings and are the computed values of the coefficient of friction between tire and road which applied during the particular stopping test in question, but are not necessarily the maximum coefficients obtainable between the tire and the particular road in question.

It is a well-known fact that when a car is moving forward with the brakes applied there is, in effect, a transfer of the weight of the vehicle from the rear to the front wheels. The amount of the weight "transferred" depends upon the height of the center of gravity of the car and the length of wheelbase. In order to determine the height of the center of gravity various cars were raised from the ground in saddles in the manner shown in Fig. 2. By use of the relations expressed in the formulas in this figure the height of the center of gravity can be computed. Table VI gives the height of the center of gravity for five cars as determined by this method both with and without driver.

With the exception of the first car listed in Table VI, it will be noted that the center of gravity is about 25 in. from the ground, a distance equal to about 22 per cent of the wheelbase. As a matter of interest, there is given in Table VII data showing that a large number of cars carry about 53 per cent of their weight on the rear wheels, and that the variation from this figure is small. Assuming an increased rear axle load of 400 lb. due to passengers, the average load on rear wheels varies from about 60 to about 75 per cent of the total with the average figure.

Turning again to the tests conducted before the Washington section, last week, it should be noted that the

Table II

Braking effectiveness of several two-wheel brake cars selected at random. Brake adjustments left untouched before tests. All tests on same dry concrete road.

Car	Distance to stop from 20 m.p.h.-ft.		Deceleration, ft. per sec. per sec.	
	Foot Brake	Hand Brake	Foot Brake	Hand Brake
H	32	70	13.3	6.2
1	38	72	11.4	6.0
K	39	117	11.0	3.7
2	40	60	10.8	7.1
3	40	100	10.8	4.3
4	43	82	10.0	5.3
5	47	90	9.2	4.8
6	52	42	8.3	10.3
7	52	76	8.3	5.7
P	54	48	8.0	9.0
M	58	108	7.5	4.0
8	61	62	7.1	7.0
9	61	155	7.1	2.8
0	62	86	7.0	5.0
10	79	150	5.5	2.9
11	98	111	4.4	3.9
Average	53	84	8.2	5.2

Table III

Results of comparison of decelerometer readings with measurements of stopping rates obtained from initial car speed and distances required to stop.

Initial Car Speed, m.p.h.	Distance Required to Stop, ft.	Deceleration, ft. per sec. per sec.	
		From Distance to Stop	From Decel- erometer
19.8	53.3	7.9	9.3
20.5	50.3	9.0	9.8
21.4	53.3	9.3	9.6
20.5	49.3	9.2	9.7
19.1	44.0	9.0	9.4
20.5	50.9	8.9	9.1
19.8	38.3	11.1	9.4
Average		9.2	9.5
10.2	14.1*	8.0	7.9
17.8	36.0*	9.4	9.8
19.7	47.6*	8.8	9.1
19.7	44.3*	9.5	9.5
19.8	40.9*	10.4	10.1
19.9	41.1*	10.7	10.7
21.2	48.2*	10.1	10.1
21.6	49.3*	10.3	11.0
25.1	67.5*	10.1	10.7
29.4	84.7*	11.0	11.4
31.3	94.3*	11.2	11.1
Average		10.0	10.1

*Distance marked on road by firing revolver loaded with a light charge of red lead at instant of brake application.

Table IV

Time between order to stop and start of deceleration of car.

Driver	Car	Time in Seconds	
		Foot Brake	Hand Brake
A	1	0.35	0.50
A	2	0.45	...
B	3	0.60	0.35
C	4	0.50	0.65
D	5	0.40	0.55
E	6	0.50	0.50
F	7	0.35	...
G	7	0.40	...
H	7	0.40	...
I	7	0.35	...
I	8	0.45	0.60
I	9	0.25*	...
I	10	...	0.40
Average		0.42	0.51

*Foot on brake pedal. In other cases foot was moved from accelerator to brake pedal.

Table V

Several values of coefficient of "traction" as determined from decelerometer readings.

Car	Road Surface	Coefficient of "Traction"
A	Dry Bituminous Macadam	0.60
A	Dry Bituminous Macadam	.62
B	Dry Bituminous Macadam	.62
B	Dry Bituminous Macadam	.65
C	Dry Asphalt	.53
D	Dry Asphalt	.71
D	Dry Asphalt	.73
E	Dry Asphalt	.68
E	Dry Asphalt	.50
E	Dry Asphalt	.75
F	Dry Asphalt	.73

*Ratio of retarding force in lb. to weight on braked wheels, lb.

Table VII

Percentages of total car weight carried on rear wheels of a number of passenger cars.

Car ¹	Total Weight	Percentage of Weight on Rear Wheels	
		Empty	Loaded ²
A	1,805	52.4	74.6
B	2,250	53.3	71.1
C	2,500	52.4	68.4
D	2,110	53.1	72.0
E	3,390	53.6	65.4
F	3,000	53.6	66.9
G	2,915	50.7	64.4
H	3,400	52.9	64.7
I	3,240	53.4	65.7
J	3,220	51.6	64.0
K	3,040	54.6	67.8
M	4,390	52.4	61.6
N	4,835	53.5	61.6
O	3,800	52.7	63.2
P	4,060	54.9	64.8
Q	5,500	56.6	64.2
R	5,180	50.3	65.9
1	1,920	54.7	62.5
2	1,770	51.4	60.4
3	2,200	53.2	60.4
4	3,110	52.9	57.9
5	2,790	54.5	60.2

Averages 53.1 64.89

¹ Data on lettered cars from Lockwood "Rear Wheel Dynamometer Tests and Their Significance to the Engineer," Herbert Chase, AUTOMOTIVE INDUSTRIES, April 20, 1922, page 662. Data on numbered cars taken at Bureau of Standards.

² Assuming 400 pounds rear axle load.

Table VI

Values for the ratio $\frac{\text{height of c. g.}}{\text{wheelbase}}$ for several widely used cars.

Car	Wheelbase inches	Height of c. g. inches		Ratio Empty	Height of c. g. Wheelbase with Driver
		Empty	With Driver		
A (Touring)	100	28.0	29.6	0.28	0.30
A (Sedan)	100	31.2	31.7	.31	.32
B (Touring)	114	25.2	25.8	.22	.23
C (Touring)	118	24.2	24.8	.21	.22
D (Touring)	108	24.3	25.0	.21	.22

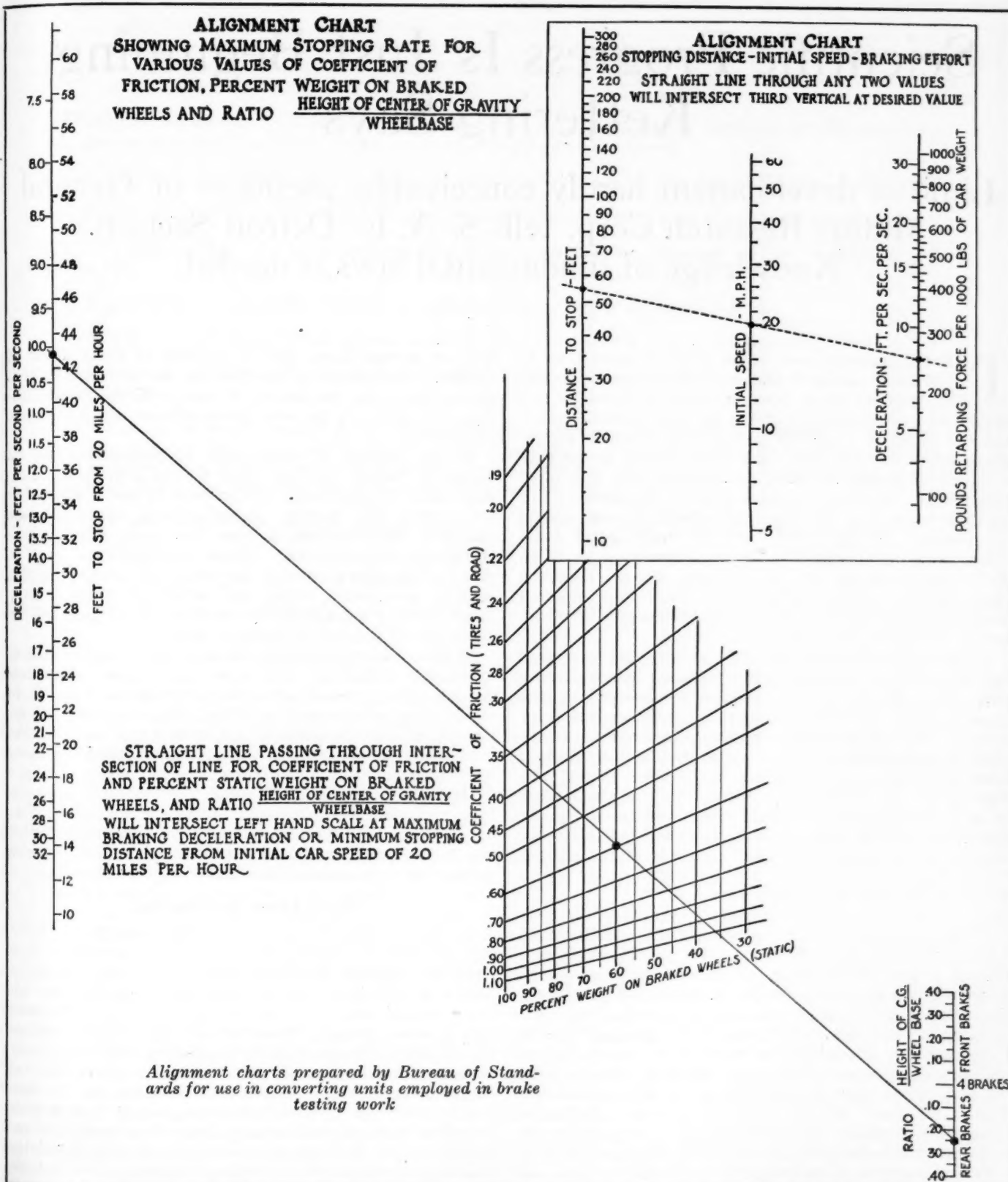
column marked "distance, line to stop, ft." is the actual distance measured from the line at which the brakes supposedly were applied to the point at which the front wheels of the car rested when it came to a standstill. In nearly every case this distance exceeds the distance computed from the accelerometer reading for the particular speed in question.

In this case the driver was not required to look at the line itself, but was instructed to apply his brakes upon a signal given by quickly dropping a flag at the instant the front wheels of the car crossed the line. The flagman in this instance was instructed to bring the flag down sharply immediately he saw the front wheels of the car touch the line. The flagman was posted across the line in the direction of the motion of the car in order that

the driver could see him readily when the front wheels of his car crossed the line.

It is interesting to note that the average rate of deceleration on the wet surface did not differ greatly from the rate on the dry surface, although it was appreciably lower. The reason for this lies in the fact already pointed out in Bureau of Standards tests that the coefficient of friction on a clean, wet surface is about the same as it is upon the same surface when it is dry.

A notable fact in all of the tests made was the absence of serious skidding. In only one of the thirty odd tests conducted was there anything approximating a serious skid and this happened on the dry pavement in the case of one car, the brakes of which appeared to be in poor adjustment.



Alignment charts prepared by Bureau of Standards for use in converting units employed in brake testing work

Cars tested in the trials staged by the Washington section included the following makes: Buick, Cadillac, Chrysler, Cleveland, Duesenberg, Franklin, Lincoln, Marmon, Oakland, Packard Six, with four-wheel brakes, Packard Six with two-wheel brakes, Rickenbacker, Rollin and Willis Ste. Claire. The Cleveland, Franklin, Lincoln and one Packard were the cars having two-wheel brakes.

In interpreting the results of the tests it should be borne in mind that the performance is not necessarily the best of which the particular makes of cars in question are

capable. Much, of course, depends upon the condition and adjustment of the brakes, the experience of the driver, the actual pressure which he was able to apply to the brake pedal and other factors, the effect of which could not well be eliminated in tests of this character. The tests are, however, interesting as indicating what is probably a rather better performance than usual in the average case.

Much credit is due the Washington section and the Bureau of Standards for staging so interesting and instructive a series of tests.

Scientific Progress Is Just Beginning, Kettering Says

Limit of development hardly conceivable, president of General Motors Research Corp. tells S. A. E. Detroit Section.
Knowledge of fundamental laws is needed.

THE fundamental laws of all sciences pertaining to matter are identical and capable of universal use. The truth of these laws becomes obscured by the complicated nomenclatures of the various scientific bodies and the result is confusion and lack of complete accomplishment in any one field. True engineering is not only a matter of purely scientific achievement, but also must comprehend economic requirements. Engineering or scientific as well as all other educational systems should be rewritten to emphasize common fundamental laws. These were the outstanding thoughts developed by C. F. Kettering, president of the General Motors Research Corp., in his address before more than four hundred members of the Detroit Section of the Society of Automotive Engineers, on March 7th.

Each decade of recent scientific history has witnessed the rewriting of fundamental principles, Mr. Kettering said, and each process of this kind has brought science in each of its branches closer to a common elementary science. Twenty years ago, organic and inorganic chemistry were apparently widely separated and specialized fields of knowledge. However, the atomic theory was wrecked on the rocks of ionization and this theory had to give way to the electronic theory which is equally applicable to both fields, so that chemistry is rapidly becoming, but a single division of the study of the laws of energy and material. Following is a digest of the major points in Mr. Kettering's talk:

"The laws governing the electronic theory are identical with the fundamental laws of mass and energy which have formed a part of the study of physics for many years. These same laws are applicable to the study of the entire relationship of mass and energy beginning with astronomy which deals with bodies of the greatest inertia. Following this is engineering which deals with bodies of ordinary dimensions. Chemistry, which is next lower in the scale, deals with the molecule and is followed by electricity, the basis of which is the electron. Following these may be added two other branches, magnetism and radiation which deal with bodies having the least inertia.

Taking each of these branches of science in turn, the division of energy and mass is demonstrated. Energy in itself is likened to a force having no carrier acting at a velocity. The mass of the body or particle or even electron forms the carrier and has but three basic characteristics, inertia, elasticity and resistance or friction. The inertia characteristic is intimately related to the velocity factor of energy and without this inertia characteristic, time in the philosophical or abstract sense has no place in engineering calculations. If there were no inertia there would be no time.

Elasticity is described as the unit of deformation per

unit of applied force and is common to every form of matter. Resistance is the friction or heat factor that enters into every phenomena of mass and energy relationship and these are the sole characteristics of all scientific phenomena.

In the analysis of every piece of mechanism and its faults or "bugs," the last three factors provide the complete base of operation. One or more elements are either too heavy—the inertia characteristic; too light—the elasticity characteristic or have too much friction—the resistance characteristic. These qualifications serve to give the complete picture of the carrier of energy. In this respect, alloy steels, rubber and petroleum which are the bases of the great automotive progress of the past twenty years are all subject to identical laws.

In spite of the similarity of basic laws, engineering is constantly stumbling over specialized types of nomenclature. The laws of astronomy are equally valuable in engineering or chemical practice. The fundamental relationships are the same in all branches of science. As a concrete example, the characteristics of titanium oxide were anticipated by a spectroscopic examination of a star at Mt. Wilson observatory which demonstrated temperature at which this compound becomes a gas. The laws of all branches of science could be condensed into a twenty-five page hand book on elementary science which dealt with fundamental mass and energy relationships.

Basic Laws Are Similar

To demonstrate this possibility, the formula $\frac{1}{2} M V^2$, was applied to several cases in every day life. This particular formulæ has been labelled as the law of falling bodies by physicists and as such has been set aside for their special pleasure. As a matter of fact the same law is basic throughout astronomy, engineering, chemistry, electricity, magnetism and radiation and has no more to do, with falling bodies than with any other mass and energy phenomena. In dealing with phenomena, the electrical profession, up-to-date, has progressed farther from the usual limitations of nomenclature than any other and approaches its problems in close relationship to underlying fundamental laws. No branch of science is complete in itself and can not be until all forms of energy are utilized to the utmost. This qualification involves the knowledge of universal laws and requires a common understanding and nomenclature of fundamental principles.

Where does mathematics come in the consideration of the basic laws? Mathematics is not a science, but is merely the quantitative expression of qualitative thought. In a mathematical calculation, the result is solely dependent upon the understanding which is put into the front end of the problem. All of the abstruse calculations in the world mean nothing if the calculator has not a sound

KETTERINGISMS

THINGS are labeled "scientific" when a man desires to talk over the heads of his listeners and a project is called "technical" when he doesn't understand it himself.

Engineering is a combination of brains and materials—the more the brains the less the material.

Engineering must partake as much of economic horse-sense as it does of scientific principles.

The fundamental laws of all sciences pertaining to matter are identical and are capable of universal use.

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No branch of science is complete in itself and cannot be until all forms of energy are utilized to the utmost.

All of the abstruse calculations in the world mean nothing if the calculator has not a sound understanding of the relationships which enter into the hypothesis. Without this understanding a mathematical calculation is just like a trip through a railroad tunnel: you have gone in some place and come out some place, but you don't know how you got there or where you have been.

The ideal engineering course should consist of four years' study of physics and four years' study of chemistry.

understanding of the relationships which enter into the hypothesis.

Without this understanding, a mathematical calculation is just like a trip through a railroad tunnel, you have gone in some place and come out some place, but you don't know how you got there or where you have been.

Principles Are Important

Before using a lot of hand-book mathematics, the calculator should go back and find out what the mathematician was before he became a mathematician. Only as the relationship of the quantities entering into the problem is understood can the results be regarded as dependable. This requirement is only fulfilled by a sound understanding of fundamentals.

Engineering must partake as much of economic horse-sense as it does of scientific principles, because, in the end, engineering is merely the adaptation of fundamental materials to the utility of mankind. If the cost of this transfer is more than the public will pay, the proposition is doomed to failure and all of the scientific theories in the world will not save it. Too often, new ventures are bound around by the terms, research, scientific and technical, and do not comprehend the necessity of making something useful at a price which will keep the organization out of the red of failure. Research is a convenient label for obtaining an appropriation about which there is some doubt.

Things are labelled scientific when it is desired to talk over the heads of your listeners and a project is called technical when you, yourself do not understand it. Engineering is a combination of brains and material, the more brains, the less material.

The ideal engineering course should consist of four years' study of physics and four years' study of chemistry. Not the usual laboratory tricks and hobbies, but a concentrated study of the fundamental relationships of elementary science. The "how and why" of fundamentals

should be inculcated to form the foundation for the approach to any problem. Nowadays too many college graduates have to unlearn too much dross after they get out of school before they get down to the fundamental truths that are the only valuable consideration.

Science and economics should be combined when undertaking any new problem or development. Too often we attempt to change the problem instead of adapting our mode of thought to its solution. We think in a rut and resent a change and continue to approach new problems from the standpoint of only our past knowledge.

Habits of Thinking Changed

For centuries men went into the arctic region and suffered all sorts of hardship and died, because they refused to change their method of thinking. They attempted to change the arctics instead of changing themselves. Finally Steffanson who possessed the capacity to change himself instead of the futile desire to change the problem, went up there and lived off of the country for thirteen years. Habits are confused with fundamental truths and the solution of the problem is hampered or fails, because our mode of thinking does not surmount its customary barriers.

Fundamental knowledge, economic judgment and pioneering thought are bringing engineers just to the threshold of scientific development. As this progress continues, new applications of energy will be utilized to relieve the present demands.

Airplanes, for example, will be propelled by radiant energy rather than by the engine which is an intrinsic part of the existing picture. The limit of development is hardly conceivable and will not be reached until practically one hundred per cent of every form of mass and energy phenomena is utilized. Only the surface has been scratched thus far, the increasing knowledge of fundamental laws and relationships will have a tremendous influence in hastening achievement.

Just Among Ourselves

Cole Makes Clay Model of New Body Design

J. J. COLE, president of the Cole Motor Car Co., used a novel method in body design in connection with the latest Cole bodies. Instead of laying out the job on a drafting board, a clay model was molded over an old design. In this way it was possible to visualize clearly and at relatively low expense just what the body lines would be. Later the job was laid out in the drafting room, of course, and exact details were filled in. Mr. Cole, who is an expert molder in clay, is said to have donned overalls and assisted materially in the working out of this new idea.

Letters of 1901 Show Giant Strides Made in Service

WHILE automotive service may not even yet be all it should be, the strides it has made in recent years have been prodigious. With 15,000,000 motor vehicles now in use, it is difficult to realize that as recently as 1901 the industry was a mere infant. This fact has been emphasized by some letters written in that year by J. W. Packard, president of the Ohio Automobile Co. and maker of the original Packard car. In one of these letters he "regretted to say" that he did "not have a single spark plug in stock" because it was necessary to import spark plugs from Europe to get those which were most reliable. In another he wrote that "it should hardly be necessary to carry an extra pneumatic tire in stock, as these tires are very durable and it is exceptional to have trouble with them." He added, however: "We could always ship one from here on telegraphic order." In the same year, in response to an inquiry, he said he did not expect to put a multiple cylinder machine on the market that year and that "we consider a single cylinder for anything less than 20 hp. much preferable

to a double or four cylinder machine." Times certainly do change.

Highway Transport Surveys Show Marked Similarity

PRECONCEIVED notions that highway transport in different States would show widely varying conditions have been shattered by surveys undertaken by the Bureau of Public Roads. Certain somewhat surprising facts were brought out first in Connecticut. Then the same data were sought in California and it was expected the figures would be entirely different, but they weren't. A third survey was started in Pennsylvania a few months ago and, strangely enough, here again the same identical trends are being found. The chief difference in both California and Pennsylvania as compared with Connecticut is that a smaller tonnage of manufactured goods and a larger volume of agricultural products are carried over the roads. This is entirely logical, however, inasmuch as Connecticut is a manufacturing rather than an agricultural State. Two or three more surveys of this character will make it possible to arrive at general conclusions in regard to the more important aspects of highway transport. Indications now are that they will show that motor trucks give the railroads little competition except for short haul, less than carload lot, business.

Small Profits Per Unit Bring Big Net Returns

CALAMITY howlers are not finding much comfort in the large number of annual reports filed recently by automotive companies. Gross earnings, in most cases, have established new records and the net has been entirely satisfactory. The fact that the percentage of profit is not as high as for some other years does not seem to be especially alarming. Small margins

have permitted capacity business, which is vastly more profitable than a higher rate on a smaller volume. If manufacturers in some other lines had been content with a smaller profit per unit and lower selling prices, they would not be complaining as bitterly as they are now of small sales. The automotive industry "has had no mother to guide her," as it were, but she has done pretty well in spite of that fact.

Willys Stages Remarkable Recovery in Three Years

ONE of the most interesting of the annual reports is that of the Willys-Overland Co., which tells of a record year with net profits of \$13,000,000, as compared with \$2,799,000 the previous year and a deficit of \$13,000,000 in 1921. The highly successful efforts of John N. Willys to rehabilitate his company have aroused the admiration of the entire industry. Less than three years ago he was supposed to be "down and out," so far as the future was concerned, but he staged a marvelous "come-back" which has been highly gratifying. He increased his production 100 per cent in 1923 and his combination now ranks third in the industry in point of output.

Bureau of Standards Work to Go On This Year

APPREHENSION lest the automotive section of the Bureau of Standards would have to suspend its work, to all intents and purposes, because of lack of funds, was a bit premature. It will be able to continue its program this year much as it did in 1923, but it can go no further unless Congress increases its appropriation by a supplemental allowance. While it is gratifying to know that the division will be able to continue for a while longer its valuable research in relation to brake linings and brake efficiency, it

More or Less Pertinent Comment on Topics of Current Interest to Men in the Industry

will be extremely regrettable if the work has to be suspended at the end of another ten months. The division has had in mind taking up next the relation of steering gears to balloon tires and four-wheel brakes and this investigation was to be started, although it is doubtful if it can be finished unless additional funds are forthcoming.

Federal Traffic Law May Force States Into Line

PERSONS who have studied the question of uniform traffic regulation are coming to the conclusion that the only way uniformity ever will be brought about will be by the adoption of a Federal law to govern interstate travel. While traffic from one State into another never will approximate that which is entirely within State boundaries, it is increasing rapidly from year to year and already has assumed very large proportions. If a Federal law were adopted governing this traffic, it is held that the States would be compelled to enact statutes of their own embodying its provisions, because they could not very well permit tourists from other States to operate under one set of rules while they compelled their own residents to obey another code. The Conference of State Motor Vehicle Commissioners seems in the best position to induce Congress to act if it finds adoption of uniform State laws is impossible. Concrete steps in the direction of uniformity cannot be delayed much longer.

Judges Are Too Lenient With Reckless Motorists

A RECKLESS automobile driver who ran down and killed a child in the District of Columbia has been sentenced to ten years in prison. If it was proven, after a fair trial, that he was wantonly careless, he deserved the punishment. Motor

Vehicle Registrar Goodwin of Massachusetts has estimated that not more than 5 per cent of all motorists disregard the safety of others, and he takes the position that such an insignificant minority of the population "should not be permitted to terrorize the rest." This is the view of the traffic safety committee of the National Automobile Chamber of Commerce and of most of the clear thinkers in the industry. The only way to bring a speed maniac to his senses is to seize his car and send him to jail. A good many judges are altogether too lenient in the punishment of such offenders. This fact was recently pointed out to the judges of Massachusetts, in scathing words, by Mr. Goodwin. He estimated that unless they get behind the safety movement, at least 600 persons will be killed and 18,000 injured in that State alone this year.

Practical Overseas Trade Help Is Goal of Owen

PERCY OWEN, the new chief of the Automotive Division of the Bureau of Foreign and Domestic Commerce, has dug into the job with an energy which is commendable. His sole purpose is to give the automotive manufacturers of the country a service which will be practical and to supply them with information which will help them actually to increase their overseas sales. All he asks is that they tell him their needs. Mr. Owen himself has been surprised at the mass of useful data available and he does not believe manufacturers generally are alive to the possibilities of assistance from the division. With a wealth of practical manufacturing experience as a background, he knows the problems of producers and is in a position to aid them materially. He cannot do it, however, unless they make their wants known. He may not be able to give them everything they ask

but he can give them more than a great many of them realize he can.

Huge Volume of Trade Shown by Car Loadings

NOTWITHSTANDING pessimistic reports from various quarters about the volume of trade, freight car loadings continue to establish new winter records. The cumulative total for the first eight weeks of 1924 was 6,679,568, an increase of 244,000 over the same period last year and of 1,116,563 over 1921. Every single week this year has been larger than any other corresponding week. In view of the fact that it is conceded buying in all lines is to meet only immediate needs, it is patent that an enormous volume of business is being done from day to day. Car loadings constitute the most reliable barometer of business.

Sees Government Driving Airplane Industry to Ruin

C. M. KEYS, president of the Curtiss Aeroplane and Motor Co., paints a gloomy picture of the status of aviation in this country in his annual report to the stockholders. He places most of the blame upon the Government, which not only has come into direct competition with commercial companies, but strives to keep the margin of profit at the lowest possible point on such planes as it orders. Mr. Keys asserts that under these conditions it has become necessary "to cease creative effort and abandon definitely the policy to regard every experimental contract as a cooperative effort with the Government." If he reflects accurately the attitude of the Government, and there is no reason to doubt that he does, it shows an exceedingly short-sighted policy in respect to a tremendously important arm of the military service.

J. D.

Close Attention to Details Is Needed in Establishing Piece Work

Scientific methods must be supplemented by intimate knowledge of particular factory. Improvement in many small operations results in large gross savings.

By Harry Tipper

"WE have had some interesting experiences in the development of piece work in our plant." It was the general superintendent who was speaking and the plant to which he referred was engaged in foundry and machine work of a miscellaneous character for a number of industrial lines.

"Of course the difficulty of arranging piece work in a factory of our type is unusual," he continued. "In the first place our castings vary from a few pounds to several tons in weight per unit. Some of them are very simple and some are quite complicated, so that we have a number of different jobs going through the pattern shop, the molding department, the core-making department, the foundry, and the machine shop at the same time.

"We have always had an idea that piece work was the most satisfactory way to pay the men, and several attempts were made to establish this system. Finally we decided to bring in some outside help to put our shop on a piece work basis. We called in three expert industrial engineers who were well recommended and who had performed satisfactory work in other establishments in the metal trades. These men studied our problem thoroughly from all angles and finally laid down piece rates for a large proportion of our jobs, but we never were able to get satisfactory results through the shop. We reestablished day work in several places and in some instances the piece work rates cost us more than had the day work.

Veteran Superintendent Successful

"The superintendent of the oldest plant started to work with us as a boy and has grown up with the establishment since its beginning. One day I asked him if he thought he could arrange piece work which would be satisfactory to us and satisfactory to the men in his plant. After thinking it over he said he was sure that he could, so we gave him the go-ahead.

"Nothing happened for a month or two and then bit by bit the different departments began to show an increased production and a decreased cost per piece. In some instances we were getting out 50 per cent more pieces, in some 25 per cent and in others as high as 300 per cent. Meantime the men were making just as much money. In one shop alone, three months after this superintendent put piece work into effect, the saving to the company was over \$100 a day.

"Knowing that this superintendent was not versed in scientific methods of time study, but that he was a good executive and had been accustomed to our plant and our kind of work most of his life, I was interested in determining how he developed this situation.

"We had a number of heavy, awkward castings which were called frames. The job of chipping these castings

with an air hammer had been priced by an expert at \$8 and a man was getting through about one frame a day. The superintendent told me that he studied this casting for a day or two and then made a proposition to the men who were on this kind of work, that they should do this particular casting for \$2, whereupon all the men laid down their air hammers ready to quit.

"Actions Speak Louder Than Words"

"He picked out the spokesman for the group and asked him why they objected, and the spokesman advanced the opinion that the form could not be chipped for \$2 in time. The superintendent said, 'Well, I haven't had an air hammer in my hand for nearly twenty years but I will undertake to chip that frame within a \$2 limit'—which he did. Inside of a week the price was accepted and the men were making just as much money but turning out four times as many frames.

"Bit by bit, job by job, the new piece work prices were put into effect without a strike, without any discontent on the part of the men. The men were earning just as much or a little more and the production went up all through the plant."

Of course this little story of the superintendent and the expert in their effect upon piece work installation does not lessen the importance of scientific examination and time study in creating proper piece work rates. It does emphasize the fact, however, that men from the outside who are dealing with the problem cannot afford to make time studies without an understanding of the operations themselves and how these operations are dealt with under similar circumstances. Neither can they afford to minimize the value of those who are accustomed to the specific work, who are thinking about the plant, and who are proficient in the particular processes. The story does indicate that systems in time study work are valuable and necessary adjuncts but that they will not displace experience, judgment and knowledge in the creation of the proper piece work conditions.

Knew Secret of Handling Men

The superintendent of this plant knew how to handle men, he knew how to reach an agreement with them, and he knew the secret of taking a thing job by job and settling each question as he went along. His experience, his alert observation, and his keen knowledge of affairs in that organization enabled him without scientific study to secure a 90 per cent piece work condition, to increase the rate of production, and to keep the workmen contented. A scientific analysis would have been very valuable to him if it had been made along lines he understood and had been supplemented by his judgment and capacity.

The important point brought out by the story is that experience, judgment, and knowledge of the processes of an organization can very frequently solve a problem without much technical aid, while technical experience and system without the judgment, capacity and knowledge of the organization are of little or no value in properly solving a production problem within any particular factory.

General Efficiency Raised

After hearing this story, I inquired about the efficiency of this superintendent along other lines. It seemed to me that a man of his alert observation and executive habit of mind would have made other changes equally important in the general organization efficiency of the plant. Examination showed this to be the case.

All through the operations were evidences of the effects of this understanding of detail and its importance in the general picture. One casting, which had required a core that added materially to its cost and decreased the possible output, had been repatterned in such a way as to eliminate the core and permit the doubling of production. Another casting, which had required an extra large riser to provide for the flow of the metal during shrinkage, had been brought down below the usual weight by a careful change in the shape of the riser.

He had found a way to keep the grinding wheels until they were three inches smaller in diameter than those previously eliminated, by rotating their uses and enlarging the number of uses for the wheels. Molding had been simplified in one or two important although minor details. The total result of the savings of the superintendent, as reported by the officers of the company, was to reduce the tonnage cost of the finished material by 43 per cent.

As in other interesting stories of production improve-

ment which have come to the writer's attention of late, there was no outstanding operation in this whole plant on which a large sum of money had been saved. In a score of places, however, considerable savings had been effected, while in a hundred other places minor changes had added to the improvement. A conversation with the superintendent was sufficient to explain the reason for this record. Evidently his whole delight was the opportunity of making an improvement in the operation or conditions of a piece of work. No detail was too small to escape his scrutiny and no suggestion from his men was too minor to be listened to. The art of giving his men proper responsibility and at the same time initiating improvement seemed to be well developed.

Small Items Count

Records such as these are passed by many times by technical writers because they do not offer any outstanding change from the usual method of procedure. It is true that they have secured 90 per cent piece work, which is a rather extraordinary percentage in view of the character and diversity of the work. It is also true that some other interesting problems in core making, pattern making and molding have been solved successfully in this organization, but the improvement has been mainly secured because of the human understanding and the patient scrutiny of detail characteristic of the superintendent of the works.

In this organization all the present supervisors have been promoted from within the organization. No attempt has been made to go on the outside and secure men for higher jobs, putting them over the heads of the older employees within. As a consequence, the employees who are in the rank and file and those who have taken one step on the way up are equally confident of the fair play of the employer and the fact that they will be recognized.

Types of Plow Bolts Are Reduced to Four

AT a conference called by the Division of Simplified Practice of the Department of Commerce held in Washington, the types of plow bolts were reduced to four, one having a square head and the others having angles of 30, 40 and 60 deg. under the heads. These bolts are to be made in sizes from 5/16 to 1 in.

At the second session of the conference the standard dimensions for carriage bolts which had been developed by Sub-Committee No. 5 of the A. E. S. C. Sectional Committee on Bolt, Nut and Rivet Proportions were unanimously endorsed with slight changes. The standard dimensions refer to the head only and cover bolts of from 3/16 to 1 in. diameter. Tolerances are added to the dimensions adopted in the revised draft of the Sectional Committee's report on Regular Carriage Bolts.

The third and fourth sessions were devoted to a consideration of standard dimensions for rough machine bolts and nuts. For the width across flats of hexagonal and square rough bolt heads the conference agreed upon the formula $W = 1.5 D$, as recommended by Sub-Committee No. 2, with slight modifications to reduce the number of wrench openings.

For the width across flats of rough nuts the following formulas were approved: For sizes up to and including $\frac{1}{2}$ in., $W = 1.5 D + 1/16$ in.; for larger sizes, $W = 1.5 D$. The widths calculated by means of these formulas are to be slightly modified, however, to reduce the number of sizes of wrench openings.

The thickness of rough bolt heads and nuts was also given very careful consideration with the adoption of the

following formulas for the thickness of nuts: For $\frac{1}{4}$ in. size, $W = D - 1/32$ in.; for 5/16 to and including $\frac{3}{8}$ in. size, $W = D - 1/16$ in.; for $\frac{3}{4}$ in. size and larger, $W = D - \frac{1}{8}$ in.

For rough hexagonal and square bolt heads it was decided to adopt the formula $W = 2/3 D$. Up to and including the $\frac{3}{4}$ in. size it is proposed to express the widths to the nearest 1/64 in. The thicknesses of the $\frac{3}{4}$, $\frac{7}{8}$ and the 1 in. sizes are to be given to the nearest 1/32 in. A change in the direction of the tolerance for these widths was made from minus to plus. For sizes from $\frac{1}{4}$ to $\frac{1}{2}$ in. inclusive the proposed tolerance is $+0.010$ in. and from 9/16 to 1 in. inclusive it is -0.020 in.

Twenty industrial and engineering organizations were represented at the conference, including the S.A.E.

THE Research Advisory Committee of the American Electroplaters' Society has outlined a program of experiments to be carried out at the Bureau of Standards which, it is hoped, will lead to the development of the best process of nickel plating. The major portion of this research program calls for the plating of a large number of specimens of cold rolled steel. After plating, the deposits will be examined both directly and under the microscope, and they will be tested for hardness, for adhesion to steel under such adverse conditions as bending and rolling, and for their resistance to corrosion. Tests will be made likewise of nickel plating on brass and other metals, to determine to what extent results obtained for steel are applicable in these cases.



New Bus with Removable Top is Installed by Fifth Ave. Coach Co.

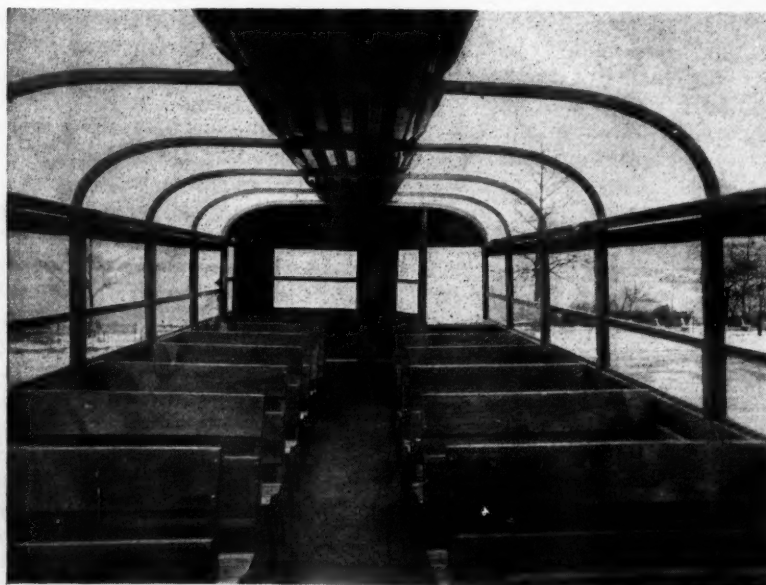
Novel covering protects the passengers from rain and snow but can be rolled up in fair weather. Front and rear are inclosed in glass panels. Capacity increased by lengthening upper deck.

AN all-weather double deck bus, which provides seating accommodations for 64 passengers, has just been built in the shops of the New York Transportation Company and now is in service on the routes of the Fifth Avenue Coach Company. The feature of this bus, aside from the increased seating capacity, is the semi-glass inclosed top, equipped with drop curtains and a roll cover of light waterproof material.

The top, which is of the removable type, is bolted to the rail of the upper deck and is completely inclosed in glass front and rear. There is a permanent roof, sup-

ported by thin slats resting on carlines, in the back and front and over the center aisle. The roll cover is attached to the roofing to the right and left of the aisle and is held in place when rolled up or lowered by Murphy fasteners. The two sections can be lowered in a few moments by the conductor. The top is made of a black glazed texture fabric.

Ten-inch glass panels are fixed in each window and a drop curtain is used which can be pulled down to the panel. The curtains overlap the panel so it is impossible for rain, snow or sleet to get in. With the top and



curtains down sufficient light still enters the inclosure through the front and rear and the panels at each seat. Electric lights furnish the illumination at night.

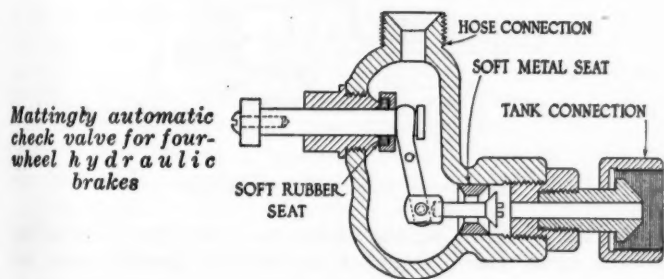
This latest bus is similar in general design with Bus 601, the first of the 2-L series built by the New York Transportation Company. This latter bus, which seats 60 persons, was exhibited at the Atlantic City convention of the American Electric Railway Association last autumn. It recently was equipped with a removable glass inclosed top.

Lengthening of the upper deck on this 64-passenger bus has permitted the addition of four more seats, bringing the capacity up to thirty-eight, all seats facing forward. There are seats for twenty-six persons in the lower deck. Seats are back to back over the rear wheels.

Aside from providing additional seating capacity, further extension of the upper deck over the driver's vestibule affords an additional safety feature. Rain would have to strike the front of the bus at less than a 45 deg. angle to interfere with the driver's vision.

New Hydraulic Brake System

A NEW four-wheel hydraulic brake system worked out by the Mattingly Automatic Valve Company of St. Louis is claimed to possess the advantage that if the connection to any of the four brake cylinders should break or otherwise become seriously defective, the remaining three brakes will not be prevented from functioning. This result is accomplished by the insertion of a Mattingly automatic valve in the line to each of the brake cylinders. A sectional view of this valve is shown herewith. This valve is said to have been successfully used for a good many years in other lines of engineering, notably as a check valve in the water gages of steam



Mattingly automatic check valve for four-wheel hydraulic brakes

boilers and between the regulator and hose connection of gas welding and cutting outfits.

Within the valve chamber are a main and an auxiliary valve. The main valve serves to cut off the flow of fluid from the line in case the latter becomes defective. Connected to the main valve by a balance lever is the auxiliary valve, which has a soft rubber seat bearing against a plug screwed into the wall of the valve chamber. The stem of this valve passes through the plug and is subjected to atmospheric pressure on its outer end, hence as long as the pressure within the chamber is above atmospheric this valve will remain seated.

The action of the valve is described as follows: When pressure is admitted to the valve chamber it is exerted against the auxiliary valve, pressing it against its seat, and this in turn holds the main valve off its seat. The passage around the main valve being somewhat restricted, allows the pressure to build up in the valve chamber and pass through it. Should the hose be ruptured or disconnected, the pressure that has been built up is suddenly reduced and the excess in pressure on the outside of the main valve closes that valve.

One of these valves is inserted in the brake line near each of the brake cylinders. It connects by a hose to the brake cylinder, which is mounted on the axle at the rear and on the steering knuckle in front. In an assembly diagram issued by the manufacturers the piston within the brake cylinder is shown connected to the brake contracting mechanism located at axle height on the side of the axle opposite the brake cylinder.

The system comprises a master cylinder containing a

piston connected to the brake pedal. Leakage of fluid from the system is automatically made up by a supply tank which connects to the master cylinder through a pipe containing a check valve. A gage on the supply tank indicates the amount of fluid remaining in it, and the supply, of course, must be replenished from time to time. The manufacturers recommend the use of a half and half mixture of glycerine or castor oil and alcohol, which, they say, will keep all parts well lubricated. In case of emergency, however, almost any other fluid will serve temporarily.

Lubricator Operates on Booster Principle

A NEW type of high pressure chassis lubricator is being marketed by the Allyne-Zerk Co. It operates on the booster principle. The grease is under comparatively low pressure in the lubricator barrel, and the pressure is increased to 5000 lb. per sq. in. in the high pressure nozzle.

The high pressure nozzle, which is the distinctive feature of the new lubricator, consists of a sliding tube with a stationary piston inside. Pressure on the handle of the gun telescopes this tube and forces lubricant out of the end of it. It is because of the small diameter of the tube and the consequent small piston area that a very high pressure can be developed.

After each stroke, as pressure on the gun handle is released, the nozzle is returned by a spring to the normal extended position. A partial vacuum is developed in the nozzle, with the result that grease from the barrel of



Allyne-Zerk lubricator

the gun is drawn into it. Owing to the existence of a slight pressure in the barrel, the nozzle is sure to fill up with grease, it is claimed.

The same shape of nozzle and nipple is used as with the former Zerk lubricator. Any thick heavy oil, like the 600-W, or any good soft zero cup grease can be fed with the Zerk automatic lubricator.

Difficult Problems Involved in Power Braking for Motor Vehicles

PART I

First application of air brakes, most extensively used type, was in 1906. Electric unit on car in 1914. Recent development work eliminates many troubles

By P. M. Heldt

THE muscular energy expended in applying the brakes of a motor vehicle is substantially proportional to the braking force required, which latter depends upon the weight of the car with load and upon the speed from which it has to be brought to a stop. For the quickest possible stop it depends more upon the weight than upon the speed.

In order to stop a car in the shortest possible distance the wheels must be almost but not quite held from rotation from the time the brakes are first applied to just before the vehicle comes to a stop. Since the coefficient of friction between the brake drum and the brake lining increases as the speed decreases, the greatest braking force can be produced at low speed, and as the car always passes through this speed range no matter from what speed it is being stopped, the pressure which must be exerted on the brake pedal is independent of the initial speed.

However, the muscular energy expended depends not only upon the pressure exerted but also upon the time during which it is maintained, which latter, of course, is greater in the case of a stop from high speed; besides, with high initial vehicle speed there is more frequent need for stopping in the shortest possible distance. Hence it is obvious that under otherwise similar conditions brake operation is more tiring the higher the speed.

There have been three developments in recent years which have made it seem desirable to reduce the effort necessary in operating the brakes. The first was the in-

creased use of heavy trucks of comparatively high speed, sometimes hauling a number of trailers, which add further to the weight to be stopped. The second was the increase in the number of women drivers, and the third the recent popularity of four-wheel brakes.

Although there was much less need for power braking

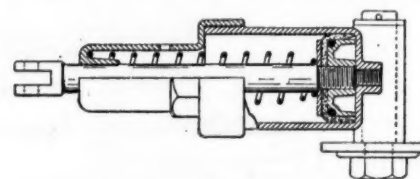


Fig. 2—Northern brake cylinder

in the early years of the industry than there is at the present time, the history of automobile development records several attempts to utilize power for brake operation. Undoubtedly the first application of power braking was in connection with electric vehicles. These vehicles, especially in the earlier years, had only a very low speed range, and the power braking feature was provided less because there was a real need or demand for it than because it could be had at almost no extra cost. All that was necessary was to provide a position in the controller movement for which the series motor was short-circuited upon itself and the field connections reversed.

Probably the first application of air brakes to passenger cars occurred on the four-cylinder Northern of 1906. This car was fitted with a plunger type air pump bolted to the engine at the rear end and operated from the end of the camshaft through a crank and connecting rod, these members being exposed. On this car air pressure was used not only for operating the brakes but also for holding the clutch in engagement and for feeding the fuel from the front-seat tank to the carburetor. Two sectional views of the air pump are shown herewith. The piston was of the same type as used in engine cylinders, with three packing rings. The air admission valve was a ball valve located in a pocket in the center of the piston head, while the delivery valve was a spring-pressed poppet valve in the cylinder head.

Both expanding and contracting brakes were fitted to the rear wheels, and of these the contracting brakes acted as service brakes and were actuated by air pressure. These brakes were applied by means of an air cylinder as shown in Fig. 2 with a piston of the leather cup type, to which air was admitted by means of the valve illustrated in Fig. 3, which was controlled by a lever located on the steering post directly under the steering wheel. The first part of

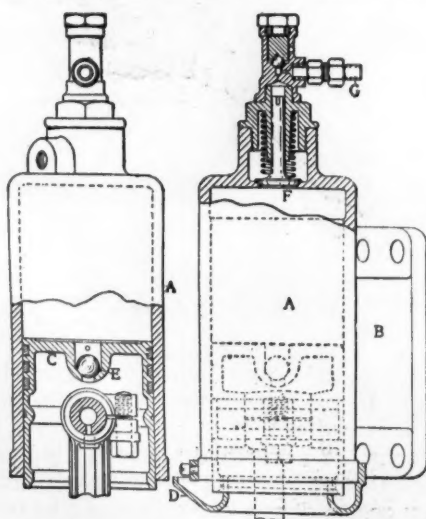


Fig. 1—Air compressor on Northern car for pumping up air for braking purposes

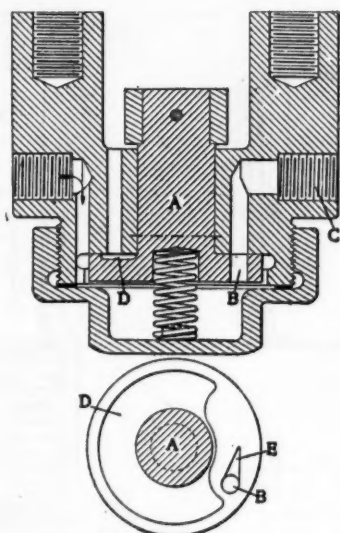


Fig. 3—Northern brake valve

the motion of this lever closed the throttle and the last part admitted air to the braking cylinder.

Referring to the sectional view of the air valve, by turning the braking lever on the steering post the valve disk A was rotated so that the port B came into registry with the port C, from which there was a pipe connection to the braking cylinder. Air entered the valve at the opposite side and, passing down, filled the chamber below the valve disk and then passed out through B and C to the braking cylinder. A tapered slot E was provided to prevent the full pressure of the pump being applied to the brake cylinder all at once, thus insuring more gradual application of the brakes.

No pressure cylinder or tank was used with this system, the braking cylinder being placed in communication with the pump directly through the control valve. The use of air-operated service brakes was continued on the 1907 Northern model and therefore seems to have proved satisfactory.

Hartford Electric Brake

At the New York automobile show early in 1914 E. V. Hartford exhibited an electrically applied brake, and later in the year he gave a demonstration of this unit mounted on a 120 hp. Chadwick car. The braking system comprised a small high speed series motor equipped with a worm reduction gear giving a reduction ratio of 100 to 1. Within the worm gear was located a cone type friction clutch

acting as a safety device, and adjacent to this there was a further gear reduction, by means of planetary gears, in the ratio of 4 to 1.

Through the planetary gear and a pawl and ratchet device a cable drum was operated, a cable wound on this drum extending back to the brake equalizing shaft. A two-step switch was provided. In the first position of the switch lever the battery circuit was closed through a resistance and the motor, this giving enough braking power for all ordinary purposes. If the brake lever was moved further the resistance was cut out of circuit and the torque of the motor then became sufficient to slip the safety clutch and apply to the brake linkage a limiting pull of 1000 lb. For applying the brake to the full extent a current of 40 amperes was required, but it was claimed that this needed to flow only for a fraction of a second. The weight of the motor and reducing gear was 35 lb.

Held on by Ratchet

Once the brake was fully applied the current could be cut off, because the brake would be held on by the pawl and ratchet. For releasing the brake the brake lever was moved to the release position, which reversed the rotation of the motor and thus removed the pull from the brake cable.

After the vacuum fuel feed had been introduced and it had become evident that the depression in the inlet manifold could be used as a source of energy, it was not very long before the idea of operating the brakes by means of it suggested itself, and in 1916 a suction brake or vacuum brake was placed on the market by the Prest-O-Lite Co. of Indianapolis. It comprised a vacuum cylinder of 7-in. bore containing a leather cup piston which had a free motion of about 4 in. The piston rod extended through the rear head of the cylinder and connected through a link to a lever on the brake equalizing shaft, while in the center of the forward head was a pipe fitting from which connection was made to a foot-operated valve set into the floor boards, of which a sectional view is shown herewith. The cylinder and its forward head were made in the form of a deep drawing of steel, and the total weight of the brake cylinder with piston, etc., was only 10 lb.

It was figured that with the throttle valve closed a depression of at least 10 lb. p. sq. in. could be obtained in the inlet manifold, and as the brake cylinder had a cross section of 29 sq. in., this would give a total pull of 390 lb. on the piston, which through the multiplication of the brake linkage could be increased to about 4000 lb. at the ends of the band brake.

Referring to the sectional view of the brake regulating

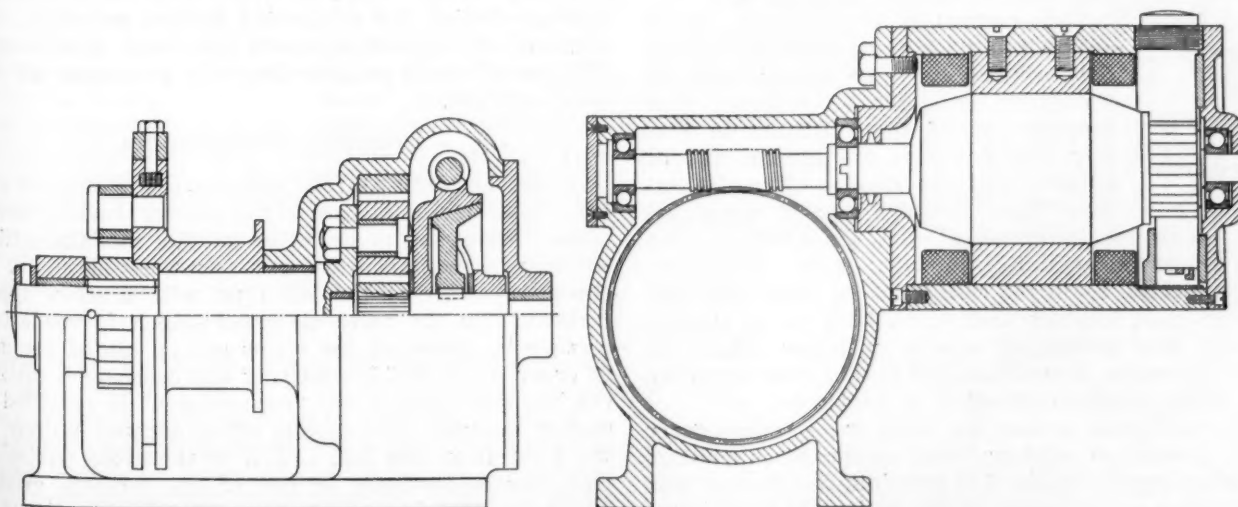


Fig. 4—Two views of the Hartford electric brake

valve, this part of the braking system was designed to give nice control of the force of brake application. It comprised a metal housing containing a piston valve balanced between two coiled springs and capable of being forced down by pressing on the plunger in the top of the housing. In the valve shown this pressure was applied directly by the driver's foot, but the concern also had a design which could be operated by a hand lever. By depressing the plunger sufficiently, communication between the parts at opposite sides of the housing was established and the depression of the inlet manifold thus communicated to the braking cylinder.

A test made on a Packard Twin-Six car was said to have shown it an easy matter to lock the rear wheels by means of the brake actuated by the inlet suction in this manner and to obtain enough braking power as long as the engine was turning over. It is believed that the reason the sale of this brake was never pushed was that shortly after it was brought out the United States entered the war and the concern which developed it then was too much occupied with other work to give the necessary attention to the brake business.

Modern Air Brakes

The most extensively used form of power brake is the so-called air brake. A supply of air or gas under pressure for operating brakes can be obtained in two ways. The first consists in inserting a check valve in the well of one of the engine cylinders, from which connection is made to a storage tank. If the pressure developed in the cylinder during the explosion exceeds the pressure in the tank, the check valves will open for an instant and allow a small quantity of the burnt gases to pass to the tank. In the course of time a pressure will be built up in the tank which is a certain proportion of the pressure of explosion. It has been found that with the engine idling the pressure which can thus be accumulated in a storage reservoir is limited to about 30 lb. p. sq. in., while under full engine load the tank pressure may rise to 200 lb. p. sq. in.

This method is the simplest, as it does not call for any special machinery for creating the necessary gaseous pressure. It might be objected that tapping one of the cylinders in this way would throw the engine out of balance, but the amount of gas vibration from the cylinder at each explosion is almost infinitesimal and the effect on the balance would be negligible in most cases. Under extreme conditions, as in the case of heavy cars with comparatively small engines and which have to be stopped frequently, this unbalanced engine operation might become objectionable, however, and it is then possible to tap two or more cylinders instead of a single one.

Another objection is that the burnt gases always carry a certain amount of solid or liquid carbonaceous material which might cause trouble if it gets into the storage tank and the valves and cylinders of the brake. It is therefore necessary to strain the gases on their way to the valves

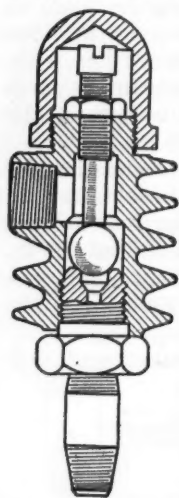


Fig. 6—Westinghouse pressure accumulator

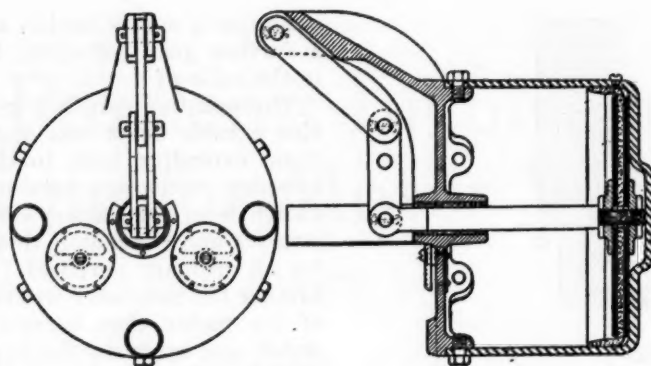
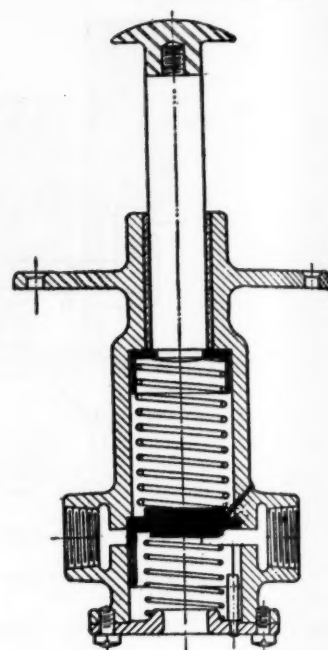


Fig. 5—Left—Brake cylinder of Prest-O-Lite vacuum brake; at right—foot-operated valve of Prest-O-Lite brake



through easily renewable straining material, and some makers of air brake equipment also make provision for cleaning the tank of carbonaceous or tarry material.

Another thing that must be taken into account is that exhaust gases contain nearly 10 per cent by weight of water vapor and that a certain amount of water will accumulate in the tank, which is apt to give trouble in winter time unless it is drained off periodically. In extremely cold weather this requires thawing out of the tank.

The alternate method of obtaining the necessary gaseous pressure consists in the installation of an air pump on the car. Not only this, but some automatic device must be provided whereby the pump is automatically started whenever the pressure in the reservoir falls below a certain minimum value and stopped when a certain maximum value is reached. This involves such complications that it is never used for road vehicles, in spite of certain advantages of pure air over burnt cylinder gases, but for motor rail cars the Westinghouse Air Brake Company furnishes an equipment which comprises a two-cylinder air pump and an automatic clutch for same which is controlled by the pressure in the tank.

Undoubtedly the greatest amount of development work in the application of air brakes to motor vehicles has been done by the Westinghouse Air Brake Company, which concern had the advantage of long experience in connection with air brakes for steam and electric railways. Westinghouse air brake equipments have been worked out for all types of motor vehicles from the passenger car to the motor rail car.

Pressure Accumulators

As developed for all road vehicles, use is made of one or two (the latter in the case of the heavier trucks) "accumulators," which are check valves screwed into the cylinders. As may be seen from the sectional view herewith, these check valves are of the ball type, with a screw type adjustment for the valve clearance which is rendered accessible by removing the screw cap on top of the device. In order to prevent overheating and consequent pitting of the ball and its seat, the "accumulator" is provided with cooling flanges. The cooling effect depends largely upon the blast from the fan, and it is therefore advisable to place the accumulator in one of the forward cylinders, where the blast is the strongest. The Westinghouse company has found it the best plan to screw it into the second

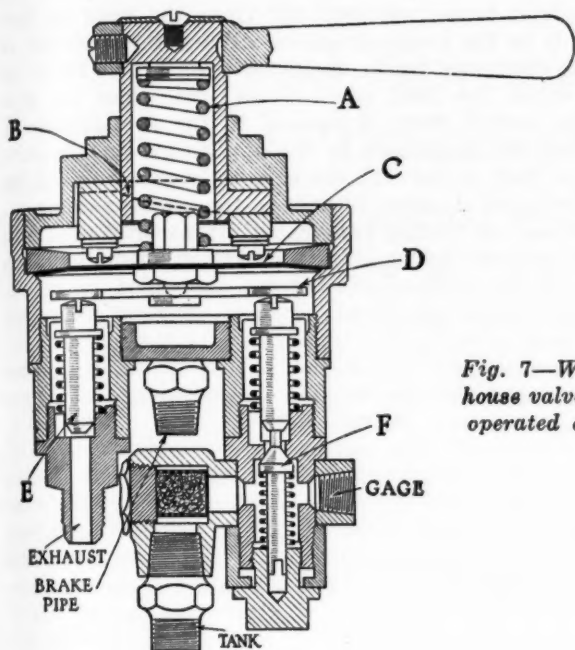


Fig. 7—Westinghouse valve hand-operated control

cylinder from the front, because in certain engines oil pumping and carbonizing troubles are most pronounced in the most forward cylinder and, besides, since this cylinder is most exposed to any dust and dirt entering through the radiator, it is more likely to develop compression leaks than those further back. The accumulator is screwed into the opening for the priming cock or, if that cannot be done, into a cap over one of the valves, a long nipple being used in the latter case. The ball check valve is adjusted to a clearance of $1/64$ in. by first screwing the stop screw down hard and then unscrewing it about one quarter turn.

From the accumulator a pipe is led to the pressure tank, which latter is made of sheet steel of sufficiently heavy gage to show a high factor of safety, and is tested to 600 lb. p. sq. in. The storage tank is so located that its bottom forms the lowest part of the system, so that all condensate will drain into it. It is also desirable to locate it on the driver's side of the chassis where the control valve is located, so that the pipe connections may be as short as possible. To comply with the laws of certain States a safety valve may be provided and screwed into one of the heads of the tank. This valve is set to blow off whenever the pressure exceeds 175 lb. p. sq. in.

The heart of any air brake system appears to be the control valve. It is not only desirable that the brakes should be applied gradually, in order to prevent sudden strains on the mechanism of the car, but the force of application should be at all times completely under the control of the driver, and when the braking force is no longer required the brakes should be released positively. This problem has been solved by the Westinghouse company in a particularly neat manner. Two types of control valve have been worked out, one of which is hand- and the other foot-operated. The hand-operated control valve is located on the steering post or on the dashboard, while the foot-operated valve is mounted below the floor, with the operating button projecting through the floorboard.

Hand Control Valve

Referring to the sectional view of the hand-operated control valve herewith, by means of the hand lever on top a coiled spring A is compressed through the action of a face cam B. This spring connects to a metal diaphragm C and bears against a cross head D resting on top of the exhaust valve E and the inlet valve F. Both of these valves are surrounded by coiled springs, the tendency of

that on the exhaust valve being to open and that on the inlet valve to close the valve.

When the control valve handle is turned around its axis it compresses the coiled spring A, thereby exerting greater pressure on the diaphragm C, closing the exhaust valve and opening the inlet valve. Air from the tank then flows through the inlet valve and the chamber below the diaphragm through a pipe to the brake chamber. After this has proceeded for a short time the air pressure in the diaphragm chamber builds up to a point where the air pressure on the diaphragm exceeds the spring pressure on it; spring A is then compressed, exhaust valve E is opened and the inlet valve F closed by the respective springs. The pressure at which this occurs depends, of course, upon the position of the control valve handle, and this is the pressure which is active in the brake chambers as long as the handle remains in this particular position. Should the handle be turned to compress the spring more, the pressure in the brake chamber will be increased, and vice versa, if the control valve handle is turned back the pressure in the chamber will be reduced. Any given position of the control valve handle therefore corresponds to a given pressure in the braking chamber and to a given braking force. The foot-operated control valve differs from the hand-operated one in that the diaphragm spring is compressed directly by the action of the foot lever, instead of through the intermediary of a cam.

Diaphragm Chambers

The brake chamber consists of two symmetrical pressed steel heads, between which is clamped a diaphragm of two layers of fabric and rubber. One side of the chamber has connected to it the air pipe from the control valve, while in the other side is located a plate with a push rod attached which is connected to the brake rigging. Diaphragm chambers have the advantage over cylinders and pistons that there is no air leakage and that no packing is required.

The brake chambers are usually connected to the rear wheel brakes, rather than to a transmission brake, which is easily explained on the ground that the rear wheel brakes require by far the greater force of application and therefore call most for power operation. A link or flexible cable is inserted between the brake lever or pedal and the point of the brake mechanism where the pushrods of the brake chambers connect, so that the lever or pedal will not be moved by the application of the brakes by the air chambers.

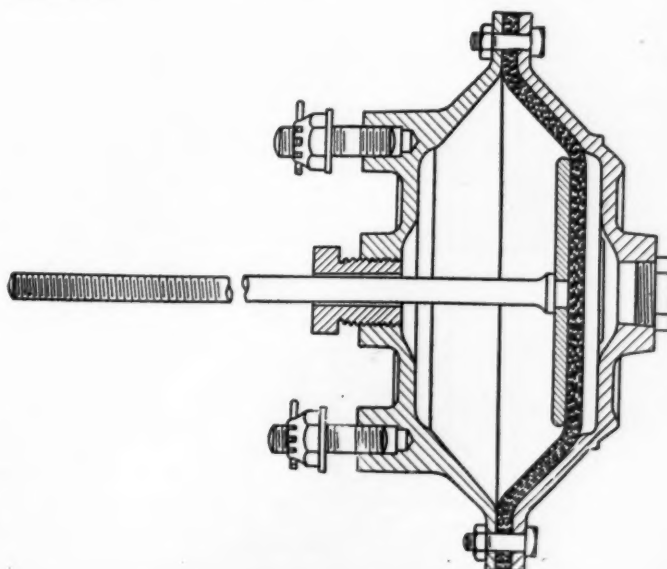


Fig. 8—Westinghouse brake chamber

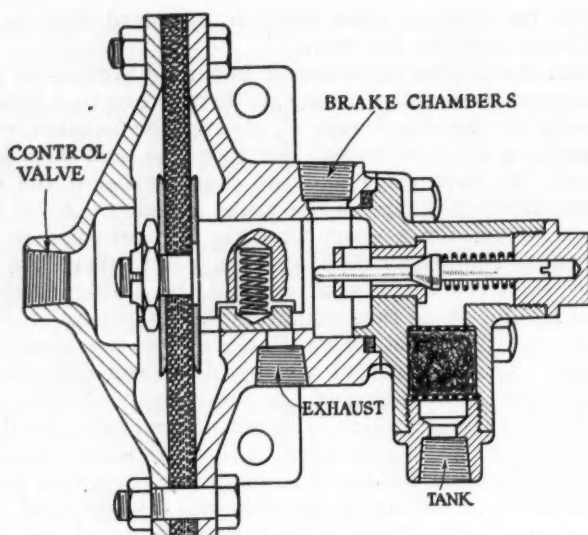


Fig. 9—Westinghouse application-release valve

Three sizes of brake chambers have been standardized, of 5, 7 and 9 in. outside diameter, with effective diaphragm areas of 6, 12 and 24 sq. in., respectively. Two of the smaller size are said to be suitable for light passenger cars, while two of the largest are usually adequate for the heaviest trucks. These brake chambers are fastened either to the frame side members or to cross members, and in some cases it is found expedient to install a special cross member for the purpose. To the side bars the brake chambers are secured by means of brackets, while a stud mounting is used if the chambers are to be carried by a cross member. The stud mounted chamber is illustrated in the diagram.

Application-Release Valve

On heavy trucks employing more than the equivalent of one 9 in. brake chamber, use is made of an additional device to secure quick application of the brakes. This is known as an application-release valve and is mounted on the truck frame between the tank and the brake chambers. As is shown in the sectional view, this valve is in the form of a diaphragm chamber containing an oil-proof diaphragm of fabric and rubber. Air from the control valve enters the left side of the diaphragm chamber and forces the diaphragm to the right, closing the exhaust port by means of a sliding valve directly connected to it, and open-

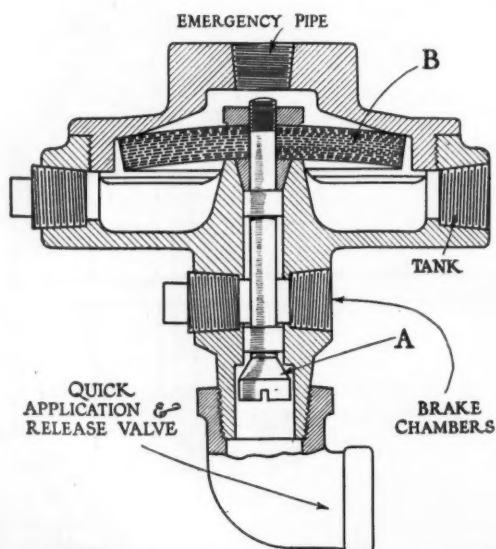


Fig. 10—Westinghouse emergency valve for road vehicle air brakes

ing the inlet valve, allowing air from the tank to flow through it to the brake chambers. When the pressure in the brake chambers builds up to that in the pipe from the control valve, the inlet valve closes, and when the pipe from the control valve is opened to the atmosphere by that valve, the diaphragm in the application-release valve is pressed fully to the left, the exhaust port opens and the air in the brake chamber escapes to the atmosphere.

In the case of tractor and trailer trains provision must be made against the possibility of trailers running away if they should accidentally become uncoupled on a hill. For such trains the Westinghouse company furnishes special braking equipment taking care of this eventuality. An emergency valve is installed on the trailer which applies the brakes in case the air line between the tractor and trailer becomes severed.

This emergency valve consists of a chamber containing a metal valve *A* and an oil-proof rubber and fabric disk *B*. The space above the disk is connected to the emergency pipe and that below it to the application-release valve, while an opening at the side leads to the brake chambers. The chamber is filled with air from the emer-

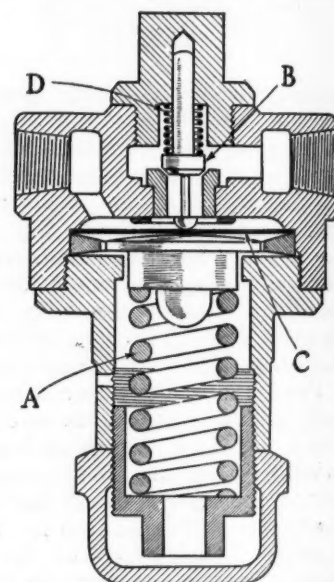


Fig. 11—Pressure reducing valve for use on trailers

gency pipe past the rubber disk *B*. Ordinarily when the brakes are to be applied the control valve operates the application-release valve as already described. Air then flows to the emergency valve through the bottom connection, past valve *A* and out the side connection to the brake chambers. Should the trailer break away from the tractor, the hose burst, etc., the sudden reduction in the pressure in the emergency pipe will cause the pressure of the air in the tank, acting under the disk, to lift the latter, and air will then flow from the tank directly to the brake chambers and apply the brakes. At the same time valve *A* is closed by the disk, thus shutting off communication with the application-release valve, the exhaust valve of which is at this time open to the atmosphere. The disk then also seals the port to the emergency pipe so that the air cannot leak out through the severed pipe.

In applications to tractor and trailer units a reducing valve is used to reduce the pressure for the trailer brakes. This consists of a regulating spring *A*, a regulating valve *B* and a diaphragm *C*. The reducing valve is connected between the tank on the tractor and the emergency pipe on the trailer. When the pressure in the emergency pipe is less than that for which the reducing valve is adjusted, the regulating valve *B* is held off its seat by the spring *A*, thus permitting the air to flow through it. Otherwise it is closed and the emergency pipe is cut off from the air tank.

Special Apparatus Tests Rickenbacker Brakes on Assembly Line

Rods are adjusted to permanent length which is not altered during road test. Equipment involves set of power-operated drums which contact with wheels and an elevating mechanism.

AS a result of the installation of a special testing and running-in station, over which each car is passed, Rickenbacker cars now leave the assembly line with their four-wheel brakes completely adjusted and run-in. At this station all brake rods are adjusted for length and the adjustment is not modified during the road tests and need not be changed at any time by the customer. At the same time the front and rear equalizers are properly positioned, as well as all of the intermediate levers, and the brake bands are run-in to make contact over substantially their whole surface.

Any adjustment which may be required later in service is made by means of the adjusting wedge forming part of each brake mechanism. In addition, the alignment of the various parts making up the brake control system is checked up at the running-in and testing station.

The equipment of the station includes a set of power-operated drums which contact with the wheels of both axles, and an elevating mechanism for lifting the wheels clear of the drums for adjustment. The elevating mechanism is fitted also with a latch which restrains the car longitudinally while the brakes are being run-in and tested. The entire structure is built above the floor, so that the top of the wheel guides is on a level with the assembly platform up to this point (approximately 28 in.

above the floor). Immediately following the testing stand, the assembly line drops down to the floor level at a rather sharp angle.

As illustrated by the line drawing Fig. 1, a drum shaft is located at each end of the fixture and each shaft is belt-driven from a 5 hp. 900 r.p.m. motor, the motors being placed side by side underneath the middle of the stand. The drums are 27 in. wood pulleys of 8 in. face, and each pair is located on its shaft at the 56 in. wheel gage distance. Guiding flanges at the ridges take up 2 in. of the drum face, leaving 6 in. width for contact with the wheels. When in operation, the peripheral speed of the drums is 950 r.p.m.

Each pair of drums is keyed to the common shaft which is carried in plain bearings that are mounted on a concrete pedestal. The drums project about $1\frac{3}{4}$ in. above the inner surfaces of the webs of 8 in. channels, which are installed with their flanges upward to form wheel guides across the top of the stand. These channels are supported at three points by structural steel work at both sides of the stand.

About $7\frac{1}{2}$ in. from the center of the drum shaft at each end is located the camshaft of the lifting mechanism, which in itself is a separate unit for each axle, front and rear. These shafts also are mounted in plain bearings

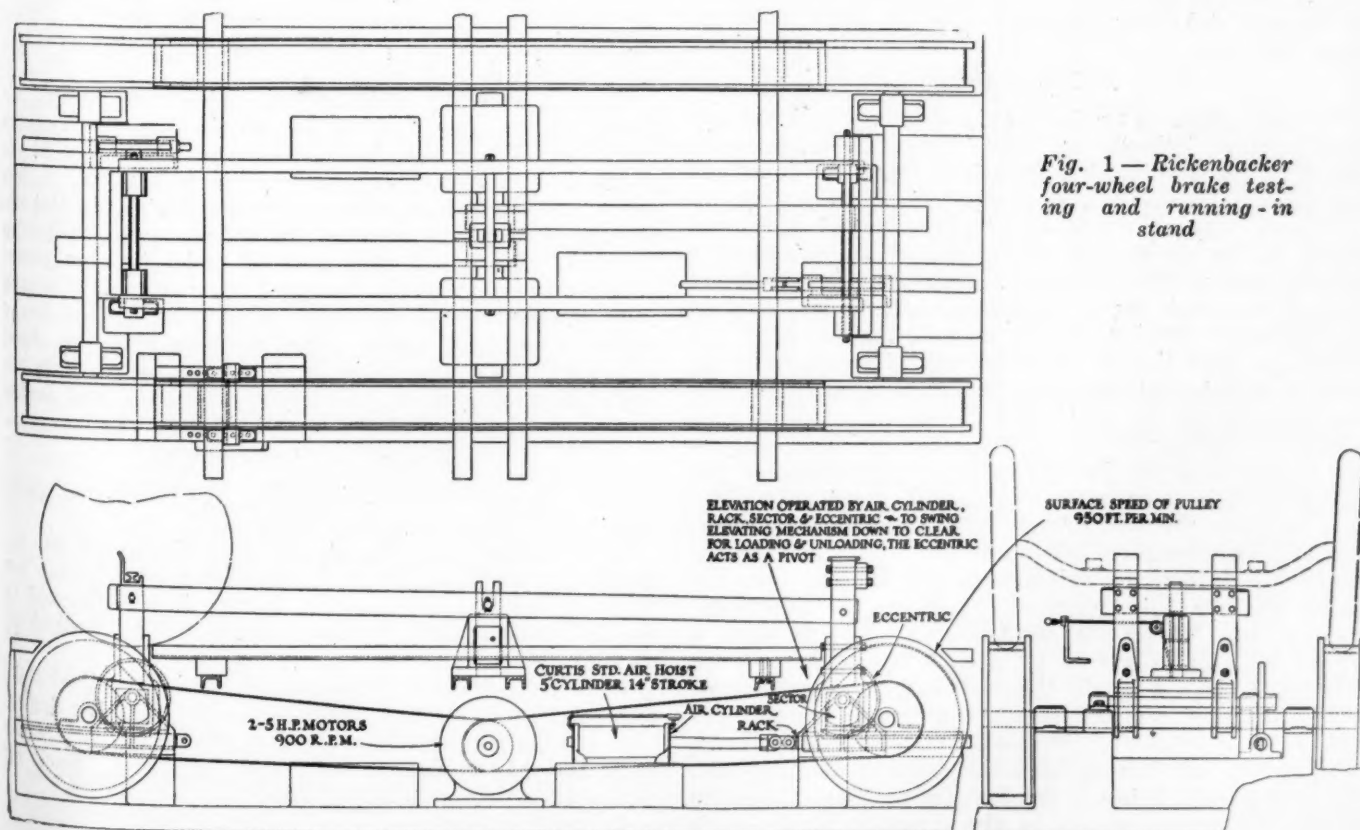


Fig. 1 — Rickenbacker four-wheel brake testing and running-in stand

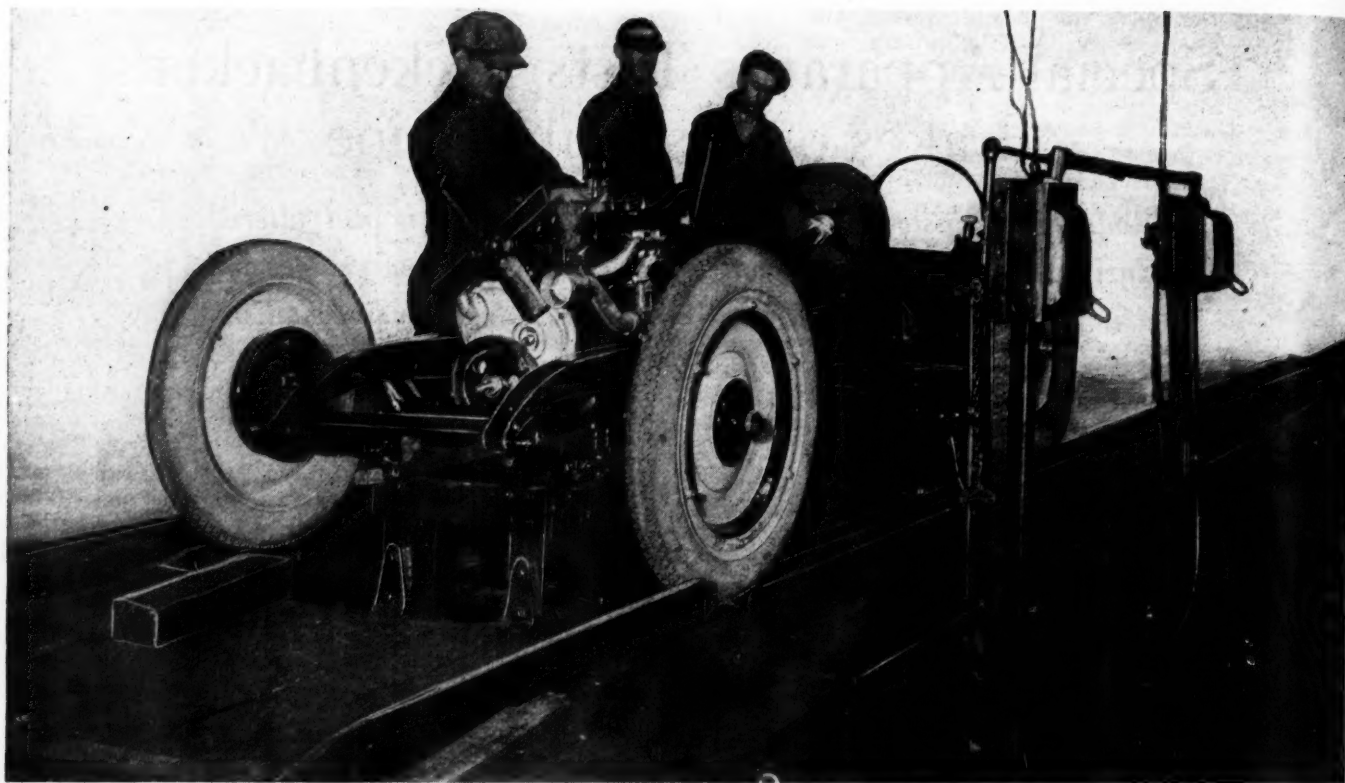


Fig. 2—Chassis in place with wheels in contact with drums. Details of front axle lifting head are shown in foreground

and each carries a sector which is driven by a rack which is operated from a pneumatic cylinder through short intermediate connecting links. One of these cylinders is shown at the right of the motor in Fig. 1, with the piston rod and links extending still farther to the right. In addition to the sector, each of these shafts carries a pair of constant diameter cams which engage with box-shaped stirrups fastened to the lower extremities of the elevating links. Each of these stirrups also fits against both sides of its cam and the cams are located at equal distances from the centerline.

Axle Supports

The axle supports are built up of 2 in. x 4 in. wood and tied together laterally by steel straps, each leg being bolted at the lower end to its stirrup. As the cams are formed and timed alike, each support carries the car up and down without tilting or swaying action. Since the stroke of the air hoist is 14 in., each sector is operated through approximately 120 deg. of motion. As translated through the cams, the actual lift of each end of the car is approximately $2\frac{1}{2}$ in., which is sufficient to cause the wheels to clear the drums under any circumstances. A hook is provided on the front support to index the lifting mechanism with the position of the car.

Wood links connect the lifting heads for each end, being supported from the vertical wooden portions of the lifting links by 1 in. pins, as shown in Fig. 1. In addition to tying the two lifting heads together, the longitudinal links also form the means for restraining the car while the drums are driving the car wheels. At the center another 1 in. pin passes between the two longitudinal links. After the car has been run into place, a slotted slide is drawn up by a cable and engages with this cross pin. When in this position, the lifting heads are in the proper positions under the axles and any car motion is prevented by the hook on the front axle head.

After the test is completed this latch is released and, the lifting heads being in the lowered position, the entire lifting framework swings in the direction of the car's

travel as it is pushed off the stand. This travel is necessary to insure that the car axles will clear the lifting device. Since the stirrups swing about the cams as centers and the whole device is tied together under parallel motion conditions, the upper supports swing over, out of the way. The upper ends of the lifting heads are then swung over toward the opposite end before the next car is pushed on the stand. The front end of the oncoming car picks up the hook on the front axle lifting head and returns the device to the approximate working position, after which the latch at the center is again engaged to establish correct position and retention.

Electric switches and air line valves are located on boards at one side of the stand, within easy reach of the operators. While no particular attempt was made at refinement in the construction of this test stand, it has proved its worth in eliminating road adjustments and the variations which sometimes occur in brake operating linkages. The car is not operated under its own power at this stage of assembly, but the 5 hp. motors have proved very satisfactory in adjusting and bringing the brake bands to uniform seats. Cars are run onto the stand with all of the brake rods disconnected. Adjustments are made only after all of the brake bands are well seated and run-in.

Operations Changed

Since the adoption of this fixture the routine of operations at this station is as follows:

1. Push car onto the stand. Practically all of the mechanical parts are in place, although the bodies are not yet installed and the steering column is not elevated to the finished position. Brake rods are not yet hooked up at their axle ends.
2. Engage latch at the middle of the longitudinal links and raise the chassis so that the wheels clear the drums.
3. Draw up the brake adjusting wedges at each wheel until the wheels cannot be turned by hand. Back off wedge adjusting nuts $2\frac{2}{3}$ turns.
4. Lower chassis.

5. Switch on motors and burn-in brake shoes, by applying each brake lever individually.

6. Raise chassis again and retighten brake adjusting wedges. Adjust brake rod length with equalizer and axle levers in proper angular relationship. Lock brake rod nuts. Slack off each brake adjusting wedge by releasing each adjusting nut $2\frac{2}{3}$ turns.

7. Again lower chassis and switch on motors. Check brakes at each end for equalization by application of the pedal. Equalization is correct when all wheels are affected to an equal extent by the pedal depression.

8. Run wheels for about 1 min. to check for heating

with brake pedal in normal released position. This time is sufficient to detect the possibility of a dragging brake shoe.

9. Release center latch and push car off the test stand down the incline to the next assembly station. One man rides with the car while the other receives the next car from the preceding station.

Two men perform all of the operations at this station and can handle 85 cars per day. Since the stand has been in operation, brake adjusting or overhauling has been entirely eliminated in the road testing department and results achieved have been excellent.

Heat Treatment Terms Defined

FOLLOWING are definitions of terms used in the practice of heat treating which were recommended by a special committee of the American Society for Steel Treating. Among the terms defined is "loneal," which is a new addition to the technical vocabulary. Any comments on the terms and definitions may be addressed to J. Edward Donnellan, 4600 Prospect Avenue, Cleveland, Ohio.

Annealing—Heating above the "critical temperature," followed by a relatively slow rate of cooling.

Loneal—Heating below the "critical temperature," followed by any rate of cooling.

Normalizing—Heating above the "critical temperature," followed by an intermediate rate of cooling. (In good practice, the heating is considerably above the "critical temperature.")

Spheroidizing—A long time heating at or about the "critical temperature," followed by slow cooling throughout the upper part of the cooling range. (For the purpose of spheroidizing the cementite in high carbon steels.)

Hardening—Heating above the "critical temperature," followed by a relatively rapid rate of cooling.

Tempering—Reheating, after hardening, to some temperature below the "critical temperature," followed by any rate of cooling.

Carburizing—Adding carbon, with or without other hardening elements, such as nitrogen, to wrought iron or steel by heating the metal below its melting point in contact with carbonaceous material.

Case Hardening—Carburizing the surface portion of an object and subsequently hardening by suitable heat treatment.

Cyaniding—A specific application of carburizing where

the object, or a portion of it, is heated and brought into contact with cyanide salt.

By "critical temperature" as used above is meant that temperature which is customarily associated with the following phenomena:

- (a) Hardening when quenched.
- (b) Loss of magnetism.
- (c) Absorption of heat.
- (d) Formation of solid solution.
- (e) Pronounced refinement of coarse grain upon cooling.

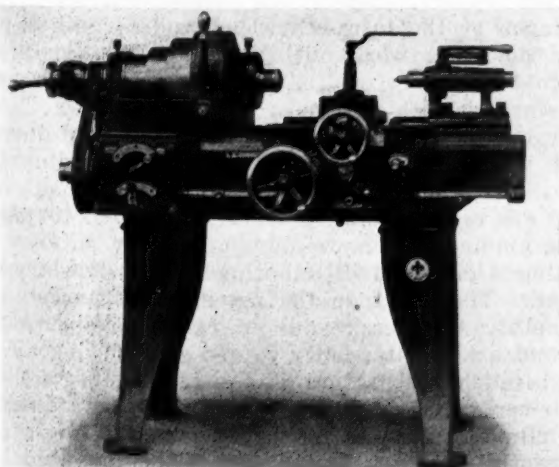
LeBlond Cone-Driven High Speed Rapid Production Lathe

AN illustration is shown herewith of an 11-in. cone-driven rapid production lathe, a new product of the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. This lathe is designed for quantity production from the bar of small parts requiring plain turning and facing operations. It possesses several novel features, particularly in the headstock, which is capable of spindle speeds up to 1250 r.p.m. Among these features are the ball-bearing mounting of the spindle, the multiple disk driving clutch and the automatic spindle brake.

When equipped with the automatic back-facing attachment the lathe becomes a semi-automatic type. This adapts it for the machining of such parts as pinion blanks, bushings, collars, washers, shoulder studs and shafts. The range of application as a plain turning lathe can be extended by the addition of chucks and a draw-in attachment. For taper turning a carriage type taper attachment is supplied.

Effects on Alloys of Rate of Cooling

ACCORDING to Dr. R. C. Reader, who contributed a paper to the recent meeting of the Institute of Metals, pure metals and those alloys which solidify at a constant temperature are not affected as regards density by the rate at which they solidify. Alloys which solidify over a range of temperature give a lower density in the interior of the bar when chill-cast, while other alloys are not so affected. Alloys which solidify through a range of temperature are inversely segregated on rapid solidification, that is, they are richer on the outside in the component of the lower melting point and richer in the center in the higher melting point component, while the alloys which solidify at a constant temperature are homogeneous throughout.



LeBlond 11-in. high speed cone-driven rapid production lathe

Details of Ethyl Gas Marketing Plans Are Announced

Will be sold through ethylizers attached to regular gasoline distributing pumps. Composition of fluid to be varied with gasoline used in different places.

By J. Edward Schipper

A LONG step towards the introduction of high-compression engines has been made, according to officials of the General Motors Chemical Corp., by the closing of contracts with refiners for the distribution of ethyl gas to all parts of the United States east of the Rocky Mountains. Six refiners and distributors have been given contracts for 18 months, covering the exclusive sales rights of the anti-detonating fluid in their respective territories. These companies are the Standard Oil Co. of Indiana, Standard Oil Co. of New Jersey, Gulf Refining, Sinclair, Sun Oil and Spears and Riddle. Details of distribution plans were announced in Dayton on March 7.

To avoid the duplication of tank and pump equipment the usual method of marketing will be by the use of ethylizers, or small auxiliary metering pumps attached to the regular gasoline distributing pump. The ethylizer has a small hand crank which measures off enough at each revolution to ethylize a gallon of gasoline. The purchaser pays a standard price of 3 cents per gallon more for the ethylized gasoline. There will be some distribution of ethylized gasoline in special tank equipment, the ethylizing of the fuel being handled at the central stations rather than at the retail pump, but the bulk of the distribution will be through attachments on the regular distributing pump.

Profits to the oil companies will be in the increased sale of gasoline induced by the ability to ethylize the fuel, as the entire 3 cents is turned over to the General Motors Corp. Inasmuch as the materials alone in the ethyl fluid are said to cost 2.4 cents for enough to ethylize a gallon of gasoline, a balance of 6 cents remains to cover the manufacture and mixing of the fluid, and the manufacture of the ethylizer. The ethylizers are loaned to the oil companies and remain the property of the General Motors Corp.

Composition of Fluid

The ethyl fluid as now distributed is tetra-ethyl-lead treated with hallogen bearing compounds. The latter have been added to neutralize the effects of the lead oxides which have a tendency to attack the spark plug terminals. Since the addition of the hallogen bearing compounds in the form of ethylene bromide and trichlor-ethylene it is claimed that the spark plug difficulty has disappeared. As various gasolines require different quantities of the ethyl fluid for the same non-detonating qualities and since it is desirable to standardize the quality per gallon, kerosene is used in small percentages varying with the nature of the fuel, so that the ethyl fluid goes out in standard size containers holding 5 liters, sufficient to ethylize 1,000 gal-

lons of gasoline. The General Motors Corp. is informed of the types of gasoline going into the various territories by the refiners having the contracts in these areas and the ethyl mixture sent is in accordance with the fuel supplied. Only one place in the country—Louisiana, which is served by two refineries with different types of gasoline—offers any difficulty, and this will be met probably by varying the color of the cans for the two gasolines.

The 5-liter cans containing the fluid for 1,000 gallons are known as amyliters and smaller 1-liter cans sufficient for 200 gallons bear the coined name, ethyliters.

The fluid is dyed red to prevent its use in cleaning and also as a protection against fraud. The ethylizers are designed so that the amyliter container is pressed over a spike which punctures the sealed top, in mounting the can in the device. The doors of the ethylizer are closed and padlocked and the fluid is pumped into a glass sight feed so that the red liquid can readily be seen by the customer.

Effect of Engine Compression

Ethyl gas sold from the pump has been treated with the anti-detonating compound to a sufficient extent to prevent detonation in engines having up to 155 lb. per sq. in. abs. compression. The exact compression will vary of course with the design of the engine. In all engines however, the proportion of ethyl liquid needed to prevent detonation goes up logarithmically with the compression so that in very high compression engines the percentage would be high. Tests have been made at the laboratory with engines having as high as 225 lb. per sq. in. compression. This requires high percentages of the tetra-ethyl-lead and for other reasons also, does not work out satisfactorily. Compressions up to 160 lb. per sq. in. have been found to be most satisfactory with the fuel.

Practically all of the ethyl compound sold during the next year will go into cars using the ordinary compressions ranging from 60 to 90 lb. per sq. in. At least one manufacturer however, already is preparing to raise his engine compressions optionally, in view of the coming widespread distribution of the anti-knock compound. The effect on the present type engine will be to nullify the knocks due to carbon and pre-ignition. Beyond a slight tendency to dry out the deposit, tetra-ethyl-lead has no action on the carbon in the cylinder. A driver will be able to carry his spark advanced in hill climbing even with a badly carboned engine. Consequently, quickest appreciation of the new fluid is to be expected in the hilly parts of the country. An absolutely new car with a clean engine will not require the

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ethyl fluid as much as an old car with fouled cylinders. In either case, however, better hill climbing and acceleration could be expected, according to the General Motors Corp., because of the freedom from pre-ignition.

From inquiries made by the laboratory officials during the past year it has been found that 75 per cent of users get increased mileage. This has been because the car had rather high compression, requiring retarded spark without the anti-knock compound, because of bad carbon formation in the cylinders or because of the ability to run leaner with the ethyl gas without a knock.

As a complement to the ethyl fluid the General Motors Chemical Corp. is soon to bring out a chemical carbon remover. This has been under development for some time and is actually in use at the present time by the Yellow Cab Co., in Chicago. It is claimed that the results are superior to burning and that the cost to the owner is about 5 cents per cylinder as compared to from 40 to 75 cents per cylinder for burning. The carbon remover is said to dissolve the tar compounds composing the bulk of the so-called carbon deposit. General Motors laboratory men, state that the free carbon in the deposit rarely goes over 5 per cent.

Experimental Work

The development of ethyl fluid provides an interesting chapter in the history of recent internal combustion research work. A number of compounds have been tried and discarded because of their cost or scarcity. One of the first materials to be tried was benzol. While this possessed anti-knock qualities, the fact that a 40 per cent mixture is necessary and that the supply is limited makes it impracticable as a universal fuel. To make the high compression engine possible, fuel supply must be available at any point in the country. Following the discarding of benzol, other materials such as triethyl arsine, aniline, ethyl-iodide, tetra-ethyl-tin, diethyl selenide and diethyl telluride have been tried and all found fairly satisfactory. All are required in far greater percentages however, than the tetra-ethyl-lead.

After the discovery of the effects of tetra-ethyl-lead, the next problem was to reduce the price of this material. The only place it could be found listed was in an old German pre-war list where it was quoted \$580.00 per lb. Methods have been developed and shortly will be patented by which the cost has been reduced to \$2 per lb. The raw materials are ethyl alcohol and lead. These two materials are treated with other compounds, which cannot be disclosed at the present time, reacted together and washed in sulphuric acid, after which the halogen bearing compounds are added. It is expected that as production increases the cost can be reduced somewhat. Eventually it is expected to have twelve mixing stations. One will shortly be constructed at Whiting, Ind., and another at some point in the East which has not as yet been determined.

Sales Plans Developed

The oil refining and distributing companies are rapidly pushing their plans to be able to supply the ethyl gas, as the ethylized fuel will be known, through their various filling stations. A campaign of education to the distributors as well as to the users is shortly to be started. One feature of this will be to combat erroneous reports regarding its toxic qualities and another to educate service stations.

The dangers of lead poisoning as a result of the cumulative effects of inhaling the exhaust or the fumes of the ethyl fluid itself are said to be negligible. In a demonstration held at the laboratory today demon-

strators submerged their hands in the fluid and no extraordinary precautions are taken in handling it in the mixing room. As a precaution, however, the fluid is sent out in the sealed tins which are not opened until the can is inserted in the ethylizer. Analysis of the exhaust shows lead to be present as a slight trace. Several cars were operated for a long period in a closed garage, and the sweepings from the floor were analyzed, showing the lead present only as a slight trace without the possibility of enough being inhaled to affect men working continuously in the garage.

Service Problems

The deposit left in the combustion chamber makes a service problem concerning which some education will be required. The lead burning changes the color of the deposit, turning the usual black carbon residue to silver, red or gray. A deposit often is left on the valves giving the appearance of a burned valve and on a casual view it might be thought that the metal was affected. Close inspection reveals that the stem or head is untouched but that a crust has formed which is soluble readily in molten sodium dioxide. The crust is largely lead oxide, the halides having volatilized out.

Another service angle found with the mixed fuel is that an owner may allow a car to run too long between inspections, because he does not notice the effects of fouling. This will require the attention of service men to induce those using the ethylized fuel to come in at the usual times for inspection.

Spark plug troubles are not expected; in fact, a reduction of trouble has been reported according to General Motors men, because of the insulating nature of the deposit. No corrosive action due to the use of the material has been found, it is claimed, in any parts of the engine, fuel line or connections. The copper strip and other standard tests have been tried and no deleterious effect noted. Early troubles in handling the fluid in the Northern states, where extremely low temperatures resulted in freezing in the ethylizer, have been overcome by the addition of tetra-ethyl-chlorine.

Car Operation Affected

Service men also will note, General Motors men claim, that drivers will handle their cars differently with the new fuel. They will become used to carrying the spark further advanced and to more rapid opening of the throttle. This is apt to result, they state, in complaints when returning to the ordinary fuel, that the car has lost some of its ability to perform on the straight fuel, whereas the difficulty is purely psychological.

Reports which come back from filling stations where the ethylizers are installed show an immediate increase in gasoline sales, it is claimed. One station in Cleveland is said to be selling 3 gallons of ethylized gasoline to one of plain. One gasoline sales official who has made several installations through Ohio finds that the sales immediately rise, then drop off to slightly above the previous level and finally start climbing. He believes that the rapid rise at first is out of curiosity and a belief in spite of all educational efforts to the contrary, that the fuel provides easy starting and phenomenal mileages. Those who get the real benefits of the fuel continue, and after the level has dropped back to these, the slow steady increase is due to the growth in the number appreciating the real effects of the treated fuel.

A demonstration held in the presence of several members of the technical press on March 7, was designed to show the effect of the addition of the ethyl fluid. A single cylinder engine running at about 1000 r.p.m. with

80 lb. per sq. in. compression pressure ran smoothly on plain gasoline. With kerosene the knock developed was severe and the amperage delivered by the dynamo driven dropped from 25 down to 17.5. The addition of a small quantity of the ethyl fluid at once removed the knock and brought the amperage back. With the plain gasoline, the addition of isopropyl nitrite made the engine knock so severely that it nearly stopped. The severity of the knock could be noted optically by a device actuated by a plunger moved by the explosion pressure in the cylinder. A rod contacts with the plunger and whenever the pressures in the cylinders reach an amount denoting a detonation, the plunger impinges on the rod sufficiently violently to throw the rod against a spring carrying an electric contact. Upon closing of the contact due to the impact of the rod, an electric lamp lights. The duration of illumination is a measure of the violence of detonation.

Following the demonstration on the test stand, demonstrations were given in high compression cars. A Cadillac coupé with 140 lb. per sq. in. compression and an Oldsmobile four with 160 lb. per sq. in. compression were taken fully loaded at low and high speeds up grades in excess of 11 per cent. on high gear without spark or

carbon knock. These cars both had the standard gear ratios, according to General Motors officials. Afterwards the Cadillac was taken out with untreated gasoline and showed clinking of the spark knock to a marked degree. Upon adding the ethyl fluid to the fuel, this disappeared.

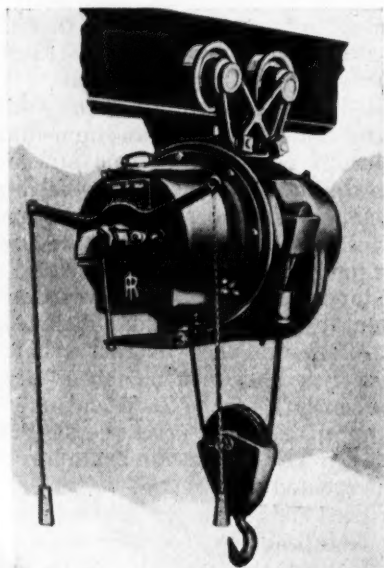
C. F. Kettering, president of the General Motors Research Corp., states that this is the first step towards the development of increased thermal efficiency at average throttle opening. He states that the average car is operating at about 5 per cent thermal efficiency. By increased compression made possible by the use of non-detonating fuel he states that it now is possible to raise this to 10 per cent, or in other words to obtain double the present mileage per gallon of fuel.

With engines designed particularly for high compressions, it is possible to use smaller powerplants for the same power, according to Mr. Kettering. This, he states, makes it possible to reduce the weight of the entire vehicle. Aviation engines running on the treated fuels now are operating as low as .37 pounds of fuel per brake horsepower-hour with compressions of 160 lb. per sq. in. This may be contrasted with .51 lb. per brake horsepower-hour, which was the mark set by the Liberty engine.

New Air Hoists Have Compact Design

A LINE of air hoists comprising five sizes, ranging in lifting capacity from 500 to 10,000 lb., has been brought out by the Ingersoll-Rand Co. of New York. Among the features of these hoists are the following: compactness of design, resulting in low head-room required and low weight; an automatic brake which will hold the load even in case of failure of the air pressure, and a graduated throttle which permits of close regulation of lifting and lowering speeds.

A balanced three-cylinder, reversible air motor is used, which is geared through a mechanical train to the hoisting drum. The throttle graduation on the new hoists is said to be very fine and to permit of instant and complete control of the hoist at any speed. A safety stop lever is provided which closes the throttle and stops the motor whenever the load is inadvertently raised to the top of the hoist lift.



Ingersoll-Rand air hoist with three cylinder, balanced, reversible motor

The automatic brake consists of a disk secured to the motor shaft and of a brake plunger with a friction face, which is held in contact with the disk by springs whenever the hoist is not operating, that is, whenever the air supply to the motor is cut off either by means of the throttle or otherwise.

Lubrication of all working parts has been given careful consideration. The motor contains a bath of oil and the gears turn in heavy grease. Oil passages lead to all bearings. Both ball bearings and bronze bushings are used in the hoist.

Welder Used on Variety of Circuits

A NEW electric welder, to be known as the Universal Arc Welding Machine, has been brought out by the Electric Arc Cutting and Welding Co. of Newark, N. J. The designation "Universal" has reference not to the range of work to which the welder is suited but to the variety of power circuits from which it may be operated.

The former welders of the concern were adapted to two different voltages, such as 110 and 220 or 220 and 440, but the new machine can be used on practically any alternating circuit. By multiple, series multiple and series combinations of the primary windings of the transformer it is possible to operate on 110, 220 and 440 volts. To make the same machine operate on either 25 or 40 cycles, taps and adapter windings are used. Adapting the machine to these various conditions was not as easy as might be thought, for the reason that the blower and the switch also must be operated under these various conditions.

The new machine can be operated even on direct current circuits of 110 and 220 volts, which requires the insertion of a resistor-reactor combination in the secondary circuit. Operation under these conditions is a radical departure in electric welding practice, but we are informed that some of these machines have been in service for two years.

Truck Transportation Growing Rapidly in Germany

Automotive development hindered by high fuel costs, poor roads, and social unrest. Diesel engines likely to replace present power-plants. Railroads cooperate.

By Dr. Albert Sommer*

Executive Manager, German Motor Fuel Corp., Dresden

THE entire question of motor traffic in Germany must be viewed with full consideration of the existing circumstances, both social and economic.

While Germany was one of the pioneers in the construction of motor vehicles in the years preceding the war and ranked about equal with other countries of its industrial size, the total number of motor vehicles has not changed much in comparison with 1914.

It is obvious, of course, that the difficulties under which Germany is laboring are so great that a comparison with this country is out of the question. Three great factors are standing in the way of German automotive development. First, the price of motor fuel; second, the condition of roads, and third, labor and social conditions.

As to the first, the bulk of the three to four hundred thousand tons of motor fuel which Germany annually consumes has to be imported from abroad. It is mostly gasoline and comes from America, Rumania, Russia and Galicia. To the base price must be added the cost of freight and the import duty, which latter amounts to \$18 per metric ton, so that the price of Navy Specification Gasoline, for instance, delivered in Hamburg in cargo lots costs up to about \$80 per ton, which is equal to about 25 cents per gallon. This is the cargo price for wholesale import at port, which, with freight, etc., added, brings the retail figures up to about 40 cents per gallon delivered in mid-Germany. To what extent these figures are out of proportion, is best illustrated by the fact that as long as gasoline was used for motor trucks the percentage of the cost of fuel was about 50 per cent of the total expenditures, whereas in this country it amounts to about 15 per cent of the cost of the haulage.

Cheaper Fuel Sought

Consequently, the most urgent problem of motor freight traffic was to replace the expensive gasoline by cheaper fuel. Efforts of motor design started to concentrate in attempts to use heavy liquid fuel for motor trucks. This problem has been solved to a certain degree. In the first place there are various types of carburetors in use which employ either mixtures of gasoline with gas oil, or other heavy distillate, or even gas oil straight, after the motor has been primed with gasoline or benzol. Distillate from brown coal tar, which is a domestic product, also is being used.

In consideration of the fact that the average consumption for a 10-ton load is about 50 to 60 liters per 100 kilometers, equal to about 4 gal. per mile, the saving thus afforded has been extraordinary. It has reduced

the cost of fuel about one-third. But this is not the sole direction of the experiments of motor truck manufacturers. Progress sought is much more far reaching. It is the uniform belief of all who are interested or connected with the motor industry, that in the near future we will replace the explosion motor by the Diesel engine.

Undoubtedly you have heard that several of the large motor truck factories have practically solved this problem, and will bring out in the course of this year motor trucks equipped with internal combustion engines, using no carburetor, or previous volatilization, and going on any fuel available. I have seen experiments going on with an ordinary truck motor which was fed with crude tar containing about 50 per cent creosote, and no particular trouble was experienced during a long run.

Heavy Oil Engines

Probably the experiments of the Siemens Schuckert-Werke, based on an Italian invention to use heavy oil by means of an incandescent bulb are also familiar. There is manufactured today a motorcycle, the engine of which operates on the two-phase principle, with the most elementary motor imaginable, using plain gas oil, or even heavier material.

This pending development is holding in abeyance to a large extent the present manufacture and sale of motor trucks. Since there is no doubt that at the very moment any of these inventions are introduced for practical use, competition against them by the old-type vehicles will not be possible in Germany. It also brings about the strange fact that when you are ordering a motor truck from one of the prominent factories in Germany, you have to wait for months before its delivery, because they are not stocking up the present models to any large extent.

A condition like this would be impossible at the moment in this country, because your enormously developed widespread service of motor trucks depends on a universal motor fuel available everywhere. If you were to change from gasoline to some heavier oil, one of the most difficult problems to solve would be the question of the availability of the heavier fuel in all places. This difficulty we do not have to contend with, as distributing stations on the American scale are entirely unknown in Germany, and there might be, at the very most, four or five single pumping stations throughout the country. Thus the reform of motor fuel will most likely bring about a large development of motor traffic throughout the country, and at the same time will create its own system of distribution.

The second difficulty in Germany is that of the street and road system. While before the war Germany had

*Address made before general meeting of motor truck manufacturers at National Automobile Chamber of Commerce, March 6.

a splendid system of well-maintained macadam roads, which, in proportion to the growing motor traffic, gradually were being re-surfaced by modern methods. The war and its after effect has entirely stopped this development. Not only have all efforts of bituminizing or otherwise solidifying road surfaces been discontinued, owing to the lack of funds, but old macadam roads have not been kept up to the old standard and are rapidly disintegrating. The dust nuisance has assumed proportions of which no one would dream in this country, and thus automobiling has reached a state of unpopularity which bars motor vehicles from some thoroughfares altogether, and, as in Saxony, has caused the closing of most roads on Sunday for motors.

Coincident with this is the social prejudice against all automobiles, which, in the general mind of the population, justifies against the user of a car any insult or even physical molestation as soon as he leaves the city limits.

Repair Costs High

From the standpoint of the use of motor trucks, the main consequence of the condition of roads is the increased cost of operation and the higher rate of repairs. The quota of repairs in our trucking corporations is approximately 30 per cent compared with 15 to 18 per cent in America. This drawback will also have to be eliminated before any larger development of our motor industry can take place.

As to the influence of social and labor conditions, Germany faces the fact that its motor vehicles cost at least 30 per cent more than those of foreign manufacture, especially American. In some instances the difference is still greater.

Such conditions as the eight-hour working day, the constantly changing of wages, and the general social unrest and enmity of classes, have resulted in a low efficiency of labor. Likewise the present high cost of railroad freights, which is largely due to the same causes, has increased the cost of raw materials, so that when I left Germany no new motor truck of any manufacture was to be had under the price of \$5,000. Old ones sold for as much as 6000 to 7000 gold marks, which is about \$1,500 to \$1,800. This, of course, is possible as long as Germany is hermetically sealed against imports of foreign products but we hope that with the reestablishing of commercial treaties, freedom of trade will set in again as an incentive to competition and thus tend to a betterment of general conditions.

Large Trucks Popular

Of the approximately 50,000 trucks which are at present in service in Germany, about one-fourth are of less than 4 tons capacity and three-fourths of more than 4 tons. The following list gives the distribution as to the special uses:

Trucks of More Than Two Tons Are Distributed as Follows:

	Number
(a) Public authorities (post office, army and navy, etc.).....	4,602
(b) In trucking business.....	5,055
(c) Breweries	2,214
(d) Grain mills.....	725
(e) Building business.....	2,053
(f) Agricultural and forest service.....	1,230
(g) Privately owned.....	19,213

A large part of the German organized motor traffic is in the hands of the so-called *Kraftsverkehrsgesellschaften*. This means motor truck corporations which

were formed immediately after the war, consisting only of public bodies, such as municipalities, states, counties, and the Federal government. Those trucks which became available after the war were turned over to them by the Federal government to be put into commercial use. There are now, distributed throughout the country, twelve of such corporations, which are managed individually but belong to one association, the headquarters of which are in Dresden. They are operating altogether approximately 2000 motor vehicles, and have branches in about eighty cities and smaller places all over the country. Their business is to rent cars either for individual jobs, or for certain periods of time.

They are all equipped with their own repair shops and the necessary staff of mechanics and operating forces. A great many of them also have vehicles for passenger transportation. They have lately combined to purchase jointly fuel and other necessities and about one-half of them have entered into an amalgamation with a fuel company which is located in Dresden of which I am the executive manager.

This combination has enabled us to supply with fuel and other necessities cars operated by other interests as well, thus increasing the efficiency of our facilities and staff. The total mileage covered in the year 1922 by all of our vehicles represents about 15,000,000 kilometers or 10,000,000 miles. It is essential to our concern that the percentages of the cost of fuel and of repairs be cut down, the latter especially by amelioration of our road system and by the substitution of obsolete cars by modern ones.

Earnings Depend on Business Activity

While the commercial earnings of these companies depend chiefly on the general business activity in the country and have been fluctuating considerably within the past few years, we are developing a certain field for which we entertain great hopes. This is cooperation with the railroad system.

In all of the motor traffic corporations mentioned, the Federal government is a shareholder and at the same time it owns the entire railway system in Germany. Among the board of directors of each local corporation is at least one representative of that particular railway district management. While at first, most of our railroad officials looked upon organized motor traffic as a competitor which had best be destroyed, some of the more far-seeing personalities have held to the opposite idea, i.e., the necessity of cooperation. This latter idea gradually made headway.

We started practical work in Berlin a little over a year ago and today it can be pronounced a thorough success.

Berlin, as you know, is centrally located and our most important railroad lines run through it. Nearly all transports from East to West or South to North have to pass Berlin. There are several individual stations not centrally connected. Whole carload lots or trains passed over a belt line. Carrying of less than carload lots and changing from one station to the other has caused the railway a great deal of extra expense, necessitated a great number of cars which were badly needed elsewhere, and resulted in great loss of time.

This business now is carried on by trucks and these goods are no longer carried over the circumference but radially through Berlin. Each individual load consists of a 5-ton motor truck and two trailers. All cars are closed like freight cars and are operated and guarded by the truck corporation's men, who are under the orders of the railway management and wear the railway uniform.



The FORUM



International Standardization Conference on Balloon Tires Urged

British manufacturer urges meeting in near future. Says that chassis builders' interests outweigh those of wheel and tire makers combined. Gives approval to American straight side type.

Editor, AUTOMOTIVE INDUSTRIES:

IN view of the world-wide controversy on balloon low-pressure tires, it is perhaps an opportune moment to review the position as it exists at the present time. In America, the straight-sided type is being marketed and already three chassis manufacturers have definitely adopted it, with some thirty others offering it as "optional." On the Continent, Michelin and other manufacturers are making progress with the beaded-edge type. In England yet another type is being manufactured; I refer to the Dunlop double-beaded wired-on balloon low-pressure tire.

In size and construction these three types of low-pressure tire are substantially similar in every way other than the beads. It is this factor which is causing so much confusion. Owing to the difference in bead construction, even though the three types of tire be identical in size, they are not interchangeable. Never in the history of motoring has an International Standardization Committee been more urgently needed than at the present moment. To emphasize this, I will quote an extract from a letter just received from a friend spending the winter at Nice:

"At the carnival I counted thirty cars fitted throughout with Michelin balloon tires. Two English cars were fitted with Dunlop balloons, and one American with straight-sided balloons. I asked the chauffeur in charge of the latter car how he would manage to get replacements in the event of trouble and his reply was that, firstly, he did not expect trouble, and, secondly, if he got it, he had a dozen spares which he had brought over with him.

"I found out that his was merely a demonstration car, and probably the two fitted with Dunlop balloons were the same.

"I could not help thinking, however, what a muddle it would be if each country persists in marketing its own type of balloon tire. Fancy being stuck up in the Pyrenees on Dunlop's or American's and only Michelin's available, which will not fit these rims. Lively outlook for motorists, isn't it?"

Foreign Service Affected

That is the whole case in a nutshell. With each country already exporting cars fitted with various types of balloon tires, the question of replacements has to be faced. It is inconceivable in 1924 to expect motor traders throughout the world to purchase and carry three stocks of balloon tires to fit what should be one design and size of rim.

The balloon tire business is in its infancy. Only a few

tire manufacturers have as yet produced this type of tire. It is the right moment to call an international congress of chassis, wheel and tire manufacturers and settle on a world-wide policy of developing and eventually standardizing one type of rim and tire. Each country has its manufacturers' association and it is up to these bodies with their huge financial resources to get busy and arrange for responsible and practical representatives to meet, either in New York, Paris or London.

It may be wondered why I have included the chassis manufacturer in what, at first sight, appears to be a problem for the wheel and tire manufacturers to solve. It is my contention, however, that the chassis manufacturer's interests outweigh those of the wheel and tire manufacturers combined. He has to fit the tires and adapt his car to give the best results.

Influence on Chassis Design

Steering and wheel clearances are vitally affected. Those who have driven cars fitted with any make of balloon tire will agree with me that at slow speeds and for turning, the balloon tire calls for substantially double and treble the effort to steer than does the standard tire. Then there is the question of the increase in fuel consumption plus loss of speed to be considered. Another thing which chassis manufacturers are concerned with is the standardization of pressures. At present, the various tire manufacturers' recommendations extend from 15 lb. per square inch on small tires to 40 lb. per square inch on the large size. The comfort of any make of car can be made or marred by correct or incorrect inflation pressures and the chassis manufacturer's reputation can be affected similarly.

An international conference of experts would think of these things and advocate the marking of the correct pressures for varying loads on the walls of the covers.

It will be observed that I have deliberately avoided criticising the advantages and disadvantages of the three types of balloon tire rims now being manufactured in different countries, but in connection with this there is one factor which is of such outstanding importance that, in my opinion, it substantially settles the question as to which type will eventually be adopted for world-wide use. I refer to the great risk of accident due to sudden deflation, say owing to a burst occurring at speed and a balloon tire leaving the rim. Of the three types only one, the American straight-side, can be relied on to remain in position.

The bead of this tire is built up of inextensible piano wires, has a sliding fit on to the rim and is locked in position by an independent flange. Of the remaining two types, the clincher or beaded-edge variety is forced over a one-piece rim by means of tire levers, while the Dunlop type actually can be fitted by hand without any tools whatever.

It will be obvious that a tire which can be forced on to a rim by either a lever or by hand can much more easily be forced off by the impetus of a car traveling at speed on a deflated tire. When a balloon deflates suddenly, it is much more difficult to control the car than when the same thing happens with a standard size tire.

It will be appreciated that on replacing balloon tires for the normal type, in order to arrive at the same periphery measurements it is necessary to decrease the size of the wheel to take the larger section tire. This means that in the event of a burst at speed and the tire leaving the rim, not only is the tilt of the car much more acute than on the standard size wheel, but the effect of the fully-tired wheel rotating against the small tireless wheel on the opposite side is such that I am doubtful if any lady driver could hold the car on the road at any speed over 30 miles per hour.

Quite apart from technical details, however, there is one significant feature in connection with the American straight-sided balloon tire which has apparently not yet been grasped by those responsible for standardization. I refer to the world-wide exports of American cars and the tire replacement business.

Presently, when all these American cars go out fitted with straight-sided balloon tires, those Continental and British manufacturers who wish to retain their export business will be compelled to manufacture and supply their overseas agents with this type of tire. The same thing applies to those American cars which come into this country. This factor, coupled with its rim retaining properties, places the straight-sided tire first on the list for standardization.

It is, therefore logical to assume that any motorist who wishes to adopt the balloon tire will be substantially safe in purchasing the straight-side type. The best policy I can recommend, however, is the waiting one. I am about to submit sets of Rapson straight-side balloon tires to long distance road and track tests, under the official observation of the R. A. C. In addition to these trials, comparative tests will be conducted between Rapson balloon and standard size tires.

F. LIONEL RAPSON,
Rapson Tyre & Jack Co., Ltd.

Properties of Tungsten and Platinum Discussed

Editor AUTOMOTIVE INDUSTRIES:

In your issue of Feb. 7, in an editorial under the heading "Contact Point Materials," we find this statement:

"In this country the place of platinum and platinum-iridium alloys in breaker contacts has been taken by tungsten to a large extent."

We believe that we understand what you intended to convey, but the statement as it stands might easily be construed to mean that tungsten had to a large extent taken the place of platinum and platinum-iridium in all types of apparatus in which platinum and platinum-iridium have been used. This is not the case, because in high tension magnetos tungsten has been found wholly unsatisfactory and is not being used for that purpose by the prominent magneto manufacturers such as Ameri-

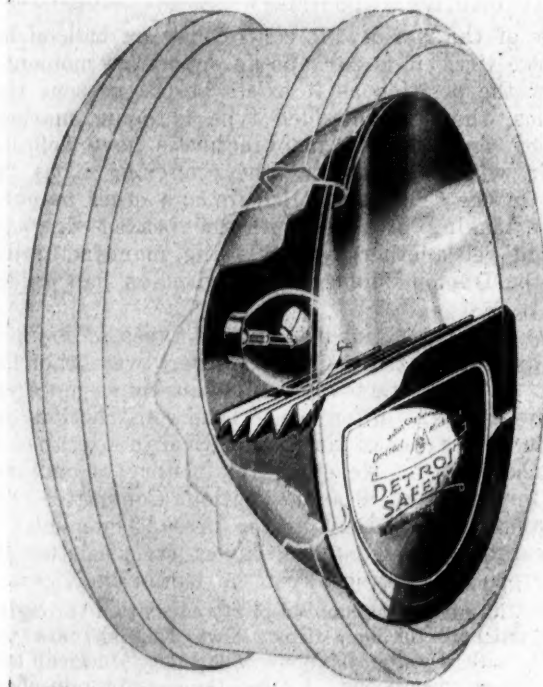
can Bosch Magneto Corp., Eisemann Magneto Corp., Splittdorf Electrical Co., Simms Magneto Co., Robert Bosch Magneto Co. and K-W Ignition Co.

It is quite true that tungsten appears to be reasonably satisfactory in battery ignition, but for that use it has always been employed and it cannot, therefore, be said that it has taken the place of platinum and platinum-iridium.

Your statements as to the properties of tungsten are to the best of our knowledge substantially correct. We feel, however, that the particular statement we quote from your editorial might be accepted by many of your readers as applying to the use of tungsten in such apparatus in which it is not now employed and that, therefore, particularly as this statement comes from a publication of such high standing as yours and has the further support of editorial opinion, it should be corrected.

W. S. GARTNER,
H. A. Wilson Co., Newark, N. J.

New Device Controls Headlight Glare



Detroit Safety Headlight device

THE Motor City Syndicate, Detroit, Mich., has placed on the market a patented unit known as the Detroit Safety Headlight device, for eliminating headlight glare and concentrating the beam on the road. As may be seen from the phantom view of a headlight fitted with this device, shown herewith, the rays from the bulb which would ordinarily strike the lower portion of the reflector are intercepted by a horizontally arranged reflector with saw-tooth surface and thrown back on the upper portion of the main reflector and thence onto the road.

The device is made of non-rusting material and is used together with a plain front glass.

AN English inventor has taken out a patent for a process of making rear axle housings from tubular stock. The whole housing is made from a single piece of tubing, which is slotted, expanded and formed in dies at the middle, thus obviating the need for extensive welding, as required with pressed steel axles.

Snow Removal Programs Encourage Car Use in Winter

Trunk line mileage cleared this year is 16,000 as against 13,000 in 1922-23. Areas having snowfall of 20 in. or more have 62 per cent of registrations. Vehicle sales affected.

THE low priced closed car has been the chief factor in promoting use of motor vehicles throughout the year, but the progress of snow removal campaigns has been an able auxiliary in many of the northern States. Since 62 per cent of the cars and trucks are located in areas which have an annual fall of snow of 20 in. or more, the importance of some organized method of keeping the highways clear in winter is evident.

The efforts of car manufacturers to provide at low cost vehicles which protect users from the weather can be offset entirely in certain sections by lack of effective means of snow removal. Every mile of highway kept clear for traffic throughout the year does its bit toward stabilizing the automobile sales curve and toward reducing seasonal fluctuations.

Considerable progress has been made in connection with snow removal during the last few years, according to data gathered by the Bureau of Public Roads, but a great deal of work still remains to be accomplished. This year, for instance, in States where snow is a problem only 30 per cent of the surfaced road mileage east of the Mississippi is included in a program for snow removal. The miles of trunk line roads which the various States in this section are clearing, however, is 16,000 this year as compared with 13,000 last year.

State and County Supervision

Snow is removed by State forces in Rhode Island, Connecticut, New Jersey, Pennsylvania, Maryland, Delaware, Virginia, Ohio, West Virginia, Illinois and Indiana and on one section of road in Minnesota. The work is left to counties, towns or other local units in New Hampshire, Vermont, Massachusetts, New York, Kentucky, Michigan, Wisconsin and the greater part of Minnesota. In Michigan and Wisconsin the counties may be ordered by the State highway department to remove snow from State roads.

Since the work of snow removal is carried on by State and county agencies, it is almost inevitable that the roads included in the snow removal program should be chosen somewhat at random, although main highways usually are kept open, of course, within the areas affected. An important road may be cleared in one State, however, and not in an adjoining one, despite the fact that no sound economic reason exists for clearing half of it and leaving the other half blocked by the drifts. This situation probably will be solved eventually by the extension of snow removal activities and by conferences regarding snow removal programs among various State officials.

Keeping clear 16,000 miles of road this year is an undertaking of considerable magnitude, as is shown by the report on this subject recently issued by the Bureau of Public Roads. Outlining the snow removal work which is being done, the Bureau report says in part:

"As indicating the size of the undertaking in various sections, the average annual snowfall ranges from 74 to 132 inches in Maine, from 25 to 92 inches in Pennsylvania, from 16 to 22 inches in Delaware, from 28 to 121 inches

in Michigan and from 9 to 101 inches in West Virginia. The above figures taken from the Weather Bureau records covering a period of years show that the problem of snow removal varies considerably in difficulty even in different parts of the same State. In nearly every State in the group the average maximum snowfall is more than twice as great as the average minimum snowfall, Delaware being the only conspicuous exception.

Pennsylvania Methods Typical

Pennsylvania, one of the pioneers in snow removal, may be taken as having an organization typical of those well organized for the work. The work is done by the State highway department with its regular maintenance forces and funds, the funds being derived from motor vehicle registration fees. The State is divided into four divisions, which are subdivided into 15 districts. Under the district engineers are 52 superintendents, 700 foremen, 6300 laborers, 130 truck drivers and 40 tractor operators. One hundred and sixty-seven trucks and 40 tractors are available, all of which are equipped with snow plows, and also 300 road machines and drags. A garage and repair shop is located within the jurisdiction of each of the 52 superintendents.

"The equipment is kept in condition for instant use and the permanently organized maintenance force is ready to start work as soon as a few inches of snow has fallen. This organization has a program for the present season of 2200 miles of primary roads to be cleared to an average width of 26 feet and secondary roads to be cleared as far as practicable.

"Representatives of the Federal bureau who have visited all of the States east of the Mississippi believe that State control of snow removal on the main trunk line roads is desirable in the interest of economy. Such work is easily coordinated with and is really a part of the maintenance of State roads.

Cost Data Meager

"Methods of snow removal vary considerably, but all States report that it is essential that work be started almost as soon as the snowfall begins and continued until the roads are cleared.

"Cost data on snow removal are somewhat meager. There is not sufficient data to arrive at even an approximate figure for the cost of removal of an inch of snow on a mile of road. However, total costs, mileage and average snowfall are known for several of the States for the winter of 1922-23.

"Pennsylvania, with an average fall of 48 inches, cleared 1850 miles at a cost of \$91,498, or \$49 per mile. Connecticut, with an average fall of 73 inches, cleared 1508 miles at a total cost of \$175,022, or \$111 a mile. Michigan, with an average fall of 74 inches, cleared 1115 miles at a cost of \$87,153, or \$78 per mile; while Maryland, with an average fall of only 23 inches, cleared 2000 miles at a cost of \$20,000, or \$10 per mile.

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Balloon Tires and Spring Business

AUTOMOBILE manufacturers are considerably worried over the badly mixed up balloon tire situation. The probability of a really heavy demand for this equipment did not seem great last fall when the car makers decided to go ahead and stock dealers for the expected spring trade. Since that time, however, conditions have changed materially. The public is demanding balloon tires and the dealers have on hand large stocks of vehicles not so equipped. Neither manufacturers nor dealers are willing to take the loss involved in scrapping the wheels and tires of regular sizes.

One prominent Detroit car manufacturer said last week, with a great deal of heat, that the balloon tire situation is likely to ruin what promised to be the most profitable spring in the history of his company. A Detroit dealer to whom this manufacturer was talking agreed very vigorously with this viewpoint.

This dealer said that inability to supply balloon tires had cut his February sales in half. It is impos-

sible, he stated, to meet the demand because tires and replacement wheels are not available. Moreover, heavy losses are involved in changing the standard units with which the cars in stock already are equipped. Both dealer and manufacturer were inclined to blame the tire makers for present difficulties.

Tire manufacturers, on the other hand, are putting much of the blame on the car builders, because the latter are insisting on sizes to meet their own individual requirements. These demands, the tire men claim, are holding up production and are directly responsible for the multiplicity of balloon sizes.

The particular car manufacturer referred to above says that balloon tires fitted to standard rims do not give satisfactory results on his car because fender clearance is reduced too much and because steering is affected adversely, clearance for steering to the left being insufficient.

Unless new wheel and tire equipment is forthcoming immediately, the effect on spring business will be disastrous, according to this executive. He advocates either a greatly accelerated manufacturing program on the part of the balloon tire builders or less balloon tire publicity for the time being.

Credit Where Credit Is Due

FRANK and open recognition of constructive achievement will do more than any other single action on the part of employers to keep employees loyal and efficient. There is a remarkable amount of truth in the Biblical statement that "man does not live by bread alone;" it has a very practical as well as a spiritual application.

The type of man who is a really competent workman and who gets a "kick" out of doing a job well for its own sake, usually has qualities of pride, ambition, and initiative which demand some intelligent recognition of his efforts if he is to continue at high speed. It is these very qualities which make the man a capable employee. Foster them and his value grows constantly; stifle them and he becomes a malcontent, powerful in spreading dissatisfaction because of his inherent qualities of superiority. An army of thoughtless, docile workers may present less immediate problems to management, but by possession of these characteristics they make impossible any high degree of efficiency or achievement.

Business relationships are about 25 per cent questions of right and justice and about 75 per cent questions of human psychology. Realization of this fact is embodied in the announcement made by the General Electric Company of a new method of giving recognition for constructive work to factory employees.

At the various plants a few days ago workmen were gathered about a platform, a few were called forward by the general manager and were presented with a sum of money and a certificate acknowledging their contribution to the progress of the electrical industry.

The awards were made by the Charles A. Coffin Foundation, named in honor of the founder of the company, which was established for the broad purpose of stimulating progress and public service in all branches of the electrical industry.

Thousands of claims for recognition were received and sifted carefully before the awards were made, but this successful organization apparently believes that the work is justified by the results. Certainly the two young foremen of the National Lamp Works, who were responsible for development of the tipless Mazda lamp and others who have made similar constructive contributions have a more kindly feeling toward their employers than if the company had assumed the credit as well as the profits for their achievement.

These awards are particularly interesting since their announcement comes the same week as a decision of the Supreme Court holding that the employer is entitled to the rights for any invention made by an employee hired specifically for the purpose of making inventions. The decision seems obviously just, but the inventor naturally feels a pride in his work and is entitled to credit for his achievement. This is true of the humblest worker in the factory.

Measuring Riding Comfort

It is generally recognized that the problem of riding comfort is a very complex one. Comfort is a physiological state, and the degree to which it is induced by any set of conditions varies with the individual.

Of course, most people react similarly to the different factors involved. Thus, if a car were driven successively at equal speeds over two roads—one with a smooth concrete or asphalt pavement and the other laid with cobble stones—all would agree that riding on the smooth road was more agreeable. Similarly, if the weight of the reciprocating parts in a four-cylinder engine were halved, it would be admitted by all that this improved the riding qualities of the car, especially under conditions of high engine speed.

By way of another illustration we might assume that the tires were inflated to 25 per cent above and 25 per cent below their normal pressure, successively, and that the car was driven over a fairly rough road, in which case it would be the general verdict that low inflation pressure was more conducive to comfort.

Thus if only one of the factors affecting riding comfort is varied at a time, and the variation is sufficiently important, the effect on the passengers is generally quite perceptible and fairly definite. Still we cannot measure the degree of comfort and express it in definite units. Attempts have been made recently to obtain a measure of the riding comfort by integrating the vertical movements of the body over a certain period or a certain distance covered, and while the figures thus obtained have a comparative value, they are not absolute.

The chief cause of discomfort undoubtedly is ex-

cessive acceleration, mainly in the vertical direction. Acceleration alone, however, is not a measure of the degree of discomfort caused, the periodicity of the motion also being a factor.

From the above it will be clear that any complete study of the problem of riding comfort must of necessity include both an investigation of the mechanical transmission of engine vibration and road shock to the passenger's body and a study of the physiological effects produced by the transmitted components or fractions of the original vibrations.

Aircraft Propulsion Without Propeller

AERIAL navigation is still in its infancy, and though practically all of the progress of the past fifteen years has been in connection with a certain type of machine, inventors are still at work on types fundamentally different, such as the helicopter. One of the most characteristic features of the modern airplane is that the propulsive force originates in a screw propeller which is driven by an internal combustion engine. The propeller creates a rearward flow of air, the slip stream, and the reaction of the slip stream against the propeller blades may be regarded as the source of propulsive effort.

The energy of propulsion is derived in the first place from the expansion of hot gases in the combustion chamber. By letting these gases escape from the combustion chamber immediately after ignition, in the direction toward the rear of the plane, a forward propulsive effort could be obtained, which would be proportional to the whole of the energy liberated during combustion. One would hardly expect a very powerful effect from such a rearwardly directed jet of hot gases, yet it must be remembered that in steam turbines, which are built in units of many thousands of horsepower, the power is produced in substantially the same way, by a jet of steam under high pressure impinging upon the blades of the rotor.

This idea of propelling marine or aerial craft by the reaction caused by a rearwardly directed jet of a fluid is not new, but heretofore the scheme has been considered as not very promising from the standpoint of overall efficiency. Now a French inventor is reported to have overcome the main difficulties connected with it and to have succeeded even in eliminating a special compressor. An experimental machine is said to have been completed and to have given such encouraging results as to induce the French Air Ministry to order a dozen more to be built.

Apparently the injector action of the rearwardly directed jet of gases of combustion is used in order to force air into the combustion chamber. It would seem, however, that some mechanical contrivance would have to be employed for increasing the pressure of the air from the injector, for the air must be forced into the combustion chamber against the same pressure that is behind the propelling jet, and the injector can hardly induce this pressure directly. How this problem has been solved is not plain from the brief reports at present available.

Balloon Tire Study Started by N. A. C. C.

Committee Will Be Appointed in
Effort to Iron Out Present
Difficulties

NEW YORK, March 10—President Charles Clifton of the National Automobile Chamber of Commerce has been authorized by the chamber to appoint a special committee of three to investigate the balloon tire situation, which is reported to be far from satisfactory from the viewpoint of the automobile manufacturers. This committee has not been named as yet, but it is expected that Colonel Clifton will make his selections this week, following which the committee will begin its investigations. The creation of this committee was approved at the N. A. C. C. members' meeting last week, when the tire situation was discussed at length.

It is expected that the committee will use its influence to bring about a closer cooperation between the Rubber Association of America and the Society of Automotive Engineers, with a view to formulating standards acceptable to both tire and car manufacturers. Also it is planned to have this committee arrive at an understanding whereby current advertising will not tend to create the impression that a car without balloon tires is not up to date.

Difficulty in Getting Tires

Many car manufacturers are experiencing difficulty in getting balloon tires as rapidly as the demand for them develops or are unable to secure the necessary wheel and rim equipment and make such other changes as may be required without upsetting seriously their production programs.

It is presumed that greater concentration on a few sizes would facilitate tire production, which now is complicated by efforts to tool up for the manufacture of the numerous balloon sizes approved by the Rubber Association. Undoubtedly some effective efforts to restrict the number of sizes demanded by N. A. C. C. members will help clarify the situation and enable better deliveries on the sizes most needed.

Efforts to supply as a temporary expedient balloon tires for existing standard rims in lieu of ordinary cord sizes have not been uniformly satisfactory. Difficulties due to inadequate clearances and hard steering are reported and are causing some apprehension on the part of car manufacturers.

It developed during the quarterly meeting of members of the chamber last week that many of the companies believe that the balloon tire was sprung on the public before the manufacturers both of cars and tires were ready to meet the demand. There does not seem to be any doubt as to the value of the innovation and there is no intention on the part of the

Business in Brief

NEW YORK, March 10—Trade and industry seem hesitant at the present moment, with big consumers displaying caution in buying ahead of their immediate needs. Weather has played a big part in this, for storms have brought about a bad condition of roads, restricting country buying in the distributive trade. Spring, only a step or so away, however, promises to remedy matters, so that when winter departs a general improvement in conditions may be expected. But just now things may be said to be spotted.

Car loadings still continue to decrease, the report for the week ending Feb. 23 showing a total of 845,898, which is 89,211 below that of the week preceding. Compared with last year, though, it is 15,711 in advance of that period. And again comparing 1923 the count for the first eight weeks of 1924 shows in favor of the new year by 3.6 per cent and 19 per cent ahead of the same stretch in 1922.

Weekly bank clearings have picked up, reports for the week ending March 6 showing a gain of 32.5 per cent over the preceding week, with \$8,810,115,000. This is 4.8 per cent better than the same week last year.

Crop reports are variable. In the Southwest conditions are generally favorable, while in the Middle West they are spotty. Seeding of oats in the Southwest is progressing well. Grains are moving lighter, although better than last year, with prices slightly higher.

The stock market showed early declines, but recovered later in the week, industrials causing a sharp advance near the end. Bonds were generally firm, with money steady.

car builders to decry the balloon, but they feel, it is reported, that their committee should investigate carefully, with a view to bringing about a standardization that will simplify the fitting of the new type.

Premature advertising, too, has caused a demand that cannot be met in so short a time, it is said, and this demand, it is felt, has slowed retail sales of cars, because the public has hesitated to buy cars fitted with other than balloon tires for fear that they are getting something out of date. Inability on the part of the tire manufacturers to produce balloons in sufficient quantities to supply the car builders with the necessary equipment has complicated matters.

With an N. A. C. C. committee making a thorough investigation and recommending reforms, it is expected that order will come out of chaos before the big buying season really opens.

Demand for Trucks Shows Steady Rise

Popularity of Buses Helps Operations—Car Schedules Continue at High Point

NEW YORK, March 10—With a production of 349,141 automobiles and motor trucks in February, the first two months of the year show an aggregate output of 665,234 as compared with 520,473 and 213,793 in the same period in 1923 and 1922 respectively. For the first quarter of last year total production amounted to 875,503, a figure that will be surpassed easily this year.

February's high mark was established in the face of a short working month, during which a record daily average of 15,180 was made. This is one indication of the exceptionally high level at which the industry operated during the month.

Of the total February output, it is estimated that truck production exceeded 31,000, which is the best mark reached since June of last year. Reports show that truck demand is steadily increasing, augmented to a considerable extent by the growing use of motor buses, a branch of truck operations.

Watching Sales Field Closely

March has started in with car producers operating on schedules somewhat higher than those followed during the earlier months of the year. Despite this, however, there is no tendency on the part of the industry to overflow the market. From now until spring buying is well under way, conditions in the sales field will be more closely studied to determine to what degree the buying public can absorb the output.

Reports from distributing centers point to an insistent demand for cars, deliveries in most instances being called for this month or next. This is evident in some districts where buying has been retarded because of local conditions. Shows continue to play an important part in determining public interest and almost without exception are drawing good crowds and developing buyers.

Producers are not being handicapped in their operations through a shortage of material or because of other factors entering into the production end. Shipments of finished products are going forward without interruption. While all means of shipping cars have increased, the

(Continued on page 639)

Gurney Bearing Sold to Marlin-Rockwell

Stockholders' Meeting Called to
Ratify Deal—H. K. Smith
Likely to Be President

NEW YORK, March 11—Stockholders of the Marlin-Rockwell Corp. of this city will be asked at a special meeting, to be held March 28, to ratify a deal made by the corporation executives for the purchase of the property, rights, privileges and franchises of the Gurney Ball Bearing Co. of Jamestown, N. Y.

The price to be paid is \$2,722,800 par value of preferred stock and 133,683 shares of no par value common stock of the Marlin-Rockwell Corp. and the assumption by the latter of all the debts, liabilities and obligations of the Gurney company.

To Act on Stock Issue

The stockholders also will be asked to authorize the issuing of additional stock to cover the purchase price of the Gurney company. This increase is necessary because at the present time the Marlin-Rockwell Corp. is authorized to issue only 89,251 shares of no par value common.

The combined plants will be operated under the direction of H. K. Smith, president of the Gurney company, who most likely will be elected president of the consolidation. Mr. Smith is turning in all of his holdings, it is reported, which include \$1,200,000 in cash.

This cash will be used to wipe out the entire bank debt of the Marlin-Rockwell Corp. and completes the rehabilitation of the latter, which has been proceeding rapidly of late, the company having discharged 20 per cent of its bank debt since December out of its own resources and earnings.

The joint companies will be controlled by the Gurney interests through the transaction which calls for three shares of Marlin-Rockwell shares in exchange for each two shares of Gurney.

Has Plant in Connecticut

Marlin-Rockwell has only one plant now, the one at Plainville, Conn., which contains a considerable part of the machinery from the Philadelphia plant, which was recently sold. The Braeburn plant also was disposed of some time ago. The Plainville plant, however, has a larger capacity for the manufacture of ball bearings than the Gurney establishment at Jamestown, while the combined facilities will give the consolidated companies capacity to make them even more powerful in the industry than they have been in the past.

The personnel of the two companies at the present time is made up of the following.

Marlin-Rockwell Corp.—A. F. Rockwell, chairman of the board; George H. Houston, president; G. W. Vaughan, vice-

Business Men of the Country Have Been Impressed with Need of Commercial Aviation Service

AN INTERVIEW WITH W. B. STOUT
Secretary of the Stout Metal Airplane Co.

By D. M. McDonald

Detroit News Representative of the Class Journal Company

Detroit, March 10.

COMMERCIAL aviation between important business cities of the United States is not more than two or three years away, the first steps coming this year with the demonstration of actual cargo carrying by planes built especially for this purpose, this to be followed by the organization of companies which will operate lines on regular schedules.

"There is nothing that can hinder this development," declares W. B. Stout, president of the Stout Metal Airplane Co., "because the need for commercial aviation service between cities has become impressed on the business men of the country and they have begun to talk our language. When these first ships are shown and their cargo-carrying possibilities demonstrated, we are confident that the establishment of regular routes will speedily follow and that the business forces of the country will be definitely behind them.

"The question of landing fields will be quickly solved when the planes are shown and companies organized to operate them. Agitation about fields previous to this time is premature at best, as it is not to be expected that cities or commercial bodies would proceed to set apart valuable tracts of ground until it was definitely certain that there would be immediate and continued use of them.

"Actual development of commercial aviation in the United States has awaited only the development of a suitable and economical type of carrier. This phase of the process is now about ended, and within the next few months we will show in all parts of the country a plane designed scientifically for cargo carrying and will demonstrate it in commercial operation between strategic business points. Though the plane will be equipped for carrying passengers, this will be only that we may accommodate those interested from a commercial standpoint. The plane has been designed purely as a cargo carrier, and it will be demonstrated with this point in view.

"In electing to design a plane for shipments rather than passengers, we have done so because of the greater certainty of arranging constant pay loads, at least at the start. The passenger-carrying development will come when the daily number seeking transportation is likewise certain. The psychological instinct against airplane travel has been eliminated in the mind of the business man to a large extent by the successful use of planes in commercial operation in Europe.

"Since the war a large number of business men in the United States have had an opportunity to observe these planes in operation and also have had occasion to use them in traveling about the continent, and are convinced not only of their safety but of their efficiency from a business viewpoint. This experience will help immensely in the location of commercial lines in the United States.

"With its great distances to be covered, the first lines here most likely will be between points where geographical conditions have greatly lengthened the distances by ordinary carriers. Specifically, communication between cities like Detroit and Cleveland, Detroit and Chicago, with intervening lakes, will be greatly shortened. It is not too much to expect that within relatively few years commercial aviation will be a fact in practically all parts of the country.

"We already have the nucleus of the first operating company in Detroit, and it is practically assured that this will be followed by companies operating in other cities. The business of the country requires air transportation, and with the business man behind it there is nothing that can be anticipated now to forestall it."

Bruening Business Sold to Cleveland Windshield

CLEVELAND, March 11—The Cleveland Windshield Manufacturing Co. has purchased all of the physical assets of the Bruening Windshield Co. and will expand its operations considerably.

N. A. Middleton, president of the Ohio Body Co., also is president of the Cleveland Windshield Manufacturing Co., with C. G. Eden vice-president, Andrea Chisholm, treasurer, and A. V. Cannon, secretary.

president; R. A. Gamble, secretary, and H. C. Pryer, treasurer. Directors are: A. F. Rockwell, Edgar Park, T. L. Chadbourne, A. J. Brosseau, J. A. Bower, George H. Houston, D. C. Roper, G. H. Kinnicutt, L. E. Stoddard, C. Horace Conner, William A. Baldwin, W. A. Bradford, J. F. McClelland and G. W. Vaughan.

Gurney Ball Bearing Co.—H. K. Smith, president; A. C. Davis, vice-president; A. W. Kettle, secretary, and J. H. Walters, treasurer. Directors are: H. K. Smith, A. C. Davis, A. W. Kettle, F. J. Galloway, E. S. Hall, C. M. Nichols and F. W. Gurney.

Willys Becomes Rail President in Toledo

His Company Joins with Wabash in Acquiring Line—Will Expedite Shipments

TOLEDO, March 10 — The Willys-Overland Co. has joined with the Wabash Railroad in the purchase of the Toledo & Western Railroad property and about 300 acres of land to construct a right of way into the local plant. The deal involves about \$2,000,000 and the expenditure of \$1,000,000 of new capital in development of the property.

The Toledo & Western Railway Co. has been incorporated by John N. Willys, president; J. E. Taussig, president of the Wabash Railroad, executive vice-president; J. H. Gerkens, treasurer, and A. B. Qualy, secretary.

The Interurban Electric Railroad has a main line extending from Toledo to Pioneer, a distance of about sixty miles, and a branch line up to Adrian, Mich., a distance of thirty-one miles from Toledo. It connects with the main line of the Wabash at Franklin on its main line and at Adrian on the branch line. The former connection is advantageous for west-bound shipments and the latter for east-bound.

Primarily a Freight Road

The line was built about twenty-five years ago and has been operated for the last thirteen years by the Henry L. Doherty interests. For more than two years it has been in receivership, and a few months ago was sold to the Doherty group for \$600,000 to satisfy the first mortgage bondholders. The line has been primarily a freight road, but has been operating at a slight loss for several years. Since its sale the electric power distributing properties have been grouped into a separate corporation.

More than two miles of track will be built to connect up with the Overland plant.

It is believed here that the new route for automobile shipments will put the Interurban road on a paying basis and permit of favorable rate adjustments on other lines. All of the Willys-Overland business is now controlled by the New York Central lines. The line also will give the company a laboratory for experimenting with gasoline rail cars or any new type of rail equipment.

Receivers will wind up their affairs by April 5, so that the new management will be able to begin carrying out its plans at once.

Plan to Make Venture Profitable

TOLEDO, March 11—High officials of the new Toledo and Western Railway Co., of which John N. Willys has become president and which is jointly owned by Willys-Overland and Wabash, say that the railroad venture is both to make money and to secure better transportation.

For many months the plant here has been hampered somewhat by its cramped railroad facilities, its inability to get plenty of cars, and from the fact that it had to deal with the New York Central lines exclusively in shipments.

The new company is capitalized at \$500,000 and that probably represents somewhat near the true price of the property, which has turned in a deficit for a number of years.

The portion of freight which the Overland can divert to the new Wabash connecting line will put it on a paying basis at once. There also is opportunity of rate reductions and favorable divisions on through rates with Wabash because both interests will split profits.

Another factor of the plan is the development of a new utility on the portion of line to be built in West Toledo. This will provide a big new residence section close to the factory and with transportation over the new track.

There is no intention of the company to build rail cars at present, but the road would furnish an excellent basis for experiment. Its passenger business is small, having been cut into by motor bus competition. Lighter electric equipment has been successful in the last two years.

The real estate end of the deal is what made the whole project run into big figures. Mr. Willys stands to profit by that, as he has owned some adjacent property for several years. The road would connect up the Mountain Varnish Co., in which Mr. Willys is heavily interested.

Southern Motors Factory Will Be Sold on April 19

HOUSTON, TEX., March 12—Properties of the Southern Motors Co., in receivership, will be sold here April 19 from sealed bids, under orders of Judge J. D. Harvey of the Eightieth District court.

Judge Harvey entered the order when informed that the proposed merger of the Southern Motors Company and National Motors would not be carried through. Previously he had entered an order allowing trustees until April 18 to complete the merger or otherwise re-finance the defunct concern.

E. F. Dupree, the receiver, will advertise for bids, which will be opened at 10 a. m., April 19. Five different bids may be entered. They may be separate, one each on the merchandise of the concern, its mechanical equipment, the light plant or the building and grounds, and one bid may be entered for the other four items combined. Each bid must be accompanied by a certified check of 15 per cent of the amount.

DUESENBERG CLAIMS' DATE

INDIANAPOLIS, March 12—W. T. Rasmussen, receiver for the Duesenberg Automobile & Motors Co., Inc., announces that April 15 is the last date on which claims against the company may be filed. Claims must be filed with the receiver, whose address is 1511 West Washington Street, this city.

Murch Elected Head of Bock Bearing Co.

Robert E. Clingan, However, Continues as Operating Head—New Directors Named

CLEVELAND, March 12 — Maynard H. Murch of the Maynard H. Murch Co., investment securities, was elected president of the Bock Bearing Co. at a meeting in this city of a number of well known Cleveland and Ohio business men, although Robert E. Clingan, vice-president and general manager, will continue as the operating head. C. O. Steinbicker was chosen secretary and treasurer. The controlling interest in the company was formerly owned by the Standard Parts Co., now in the process of liquidation.

W. E. Bock, president of the Erie Glass Co., Toledo; W. S. Quinlan, president of the Chicago Nut Manufacturing Co.; W. G. Mather, president of the Cleveland Cliffs Iron Co.; F. F. Prentiss, vice-president of the Cleveland Twist Drill Co.; John A. Kling, vice-president of the Kelley Island Lime & Cement Co.; George E. Randles, president of the Foote-Burt Co., and R. B. Wallace of the Kinney Steamship Co. were added to the board of directors of the company.

R. E. Clingan, George E. Randles and W. S. Quinlan were appointed to the executive committee.

Buy Standard Parts Holdings

The preferred stockholders of Bock Bearing Co. have purchased from the receiver of the Standard Parts Co. the 11,695 shares of common stock, and this with the 305 shares held in the treasury, gives the Bock company a capitalization of 12,000 shares of no par value common and \$337,200 of preferred. The Bock stockholders also have purchased property adjoining the Bock plants in Toledo and patents that cost the Standard Parts Co. \$379,000.

President Murch pointed out that while the Standard Parts is in the hands of a receiver, this is not so of the Bock company, and that now it is free of Standard Parts it will enjoy a better trade position. A satisfactory volume of business on hand was reported, and through arrangements made with British Bock Bearing, Ltd., the foreign trade is expected to increase. Current assets were reported to be twice current liabilities and there is a surplus of \$501,582.

Benzer Awards Selling Rights Covering Europe

PARIS, March 1 (by mail)—Exclusive marketing rights throughout Europe for the lenses manufactured by the Benzer Corp. of Brooklyn, N. Y., have been secured by the H. Champoiseau Co. of Paris. This firm, which will import from the American factory, will begin business simultaneously in France and England, and will later extend to other European countries.

U. S. Rubber Profits Cut by Tire Prices

Sales Increased Over 1922—
President Steger Optimistic
Over 1924 Outlook

NEW YORK, March 10—As in the case with others in the tire industry, the United States Rubber Co. reports that because of price fluctuations last year, 1923 failed to show the financial returns commensurate with the business done. While sales for the year amounted to \$186,261,381, including all branches of its business, which is an increase of \$17,475,031 over 1922, this 10.35 per cent advance failed to top the preceding year's net profits by a small margin, showing \$12,161,055, in comparison with \$12,662,111.

All of the increase in sales volume was in sales of commodities other than tires. Excluding tires, which at selling prices prevailing during the year constituted substantially less than one-third of the total sales, the increase in dollar volume of sales was approximately 20 per cent.

Current Assets Big

The company's annual report also states that current assets as of Dec. 31 amounted to \$125,135,970 and current liabilities to \$50,438,475. The consolidated surplus totaled \$32,584,590. Dividends on the preferred stock amounted to \$5,538,718, leaving a surplus for the year of \$1,853,939. Interest on the funded indebtedness was \$4,768,398, leaving a net income of \$7,392,657, after all interest and other charges. This equals \$2.28 a share on the \$81,000,000 common outstanding, against \$2.68 in 1922.

Contractual liabilities, representing forward commitments for raw materials and supplies, amounted to approximately \$10,000,000.

The company retired \$956,000 of funded indebtedness during the year through the operation of the sinking funds, being \$772,000 of 5 per cent bonds and \$184,000 of 7½ per cent notes.

Steger Outlines Conditions

In a letter to stockholders, President C. B. Steger comments as follows:

The company more than maintained its position in the tire trade as to unit sales, but the results were unsatisfactory owing to general conditions in the industry. Because of adjustments made during the year, selling prices of tires reached the lowest level ever known. This was especially true in sales to automobile manufacturers.

Since the close of the year it has been possible to obtain higher prices from automobile manufacturers, and cost of distribution has been reached by consolidations of sales branches and other changes. In view of these changes, and what seems to be a more stable condition in the tire industry, it is hoped that results from sales of tires during 1924 will show substantial improvement.

The development of rubber plantations owned by the company has progressed satisfactorily. The properties are located in

CENSUS IS ORDERED OF BRITISH OUTPUT

WASHINGTON, March 11—An order of the British Board of Trade has been issued, calling for a census of production statistics in all manufacturing lines in the United Kingdom for the year 1924. This order, if carried out, will mean the appearance of the first official production figures since 1907.

Opposition to the order is already being voiced by the British automotive manufacturer, the United States Bureau of Foreign and Domestic Commerce has been advised. As in the past, the automobile industry in that country has been antagonistic toward such a census, on the ground that the highly competitive position of Great Britain makes it undesirable to let manufacturers in other countries know what Great Britain is producing per annum.

Sumatra and on the Malayan Peninsula. Those in Sumatra comprise a total of 88,659 acres, of which 50,545 acres have been planted and 43,627 acres of the planted areas are in production. Those on the Malayan Peninsula comprise 22,484 acres, of which 11,078 acres have been planted, with 2030 acres in bearing.

The rubber produced on these plantations is taken over by the United States Rubber Co. at current market prices, and enters into its manufacturing costs at these prices. On this basis the plantations produced a profit for the year, after providing conservative reserves for depreciation of plant and equipment and amortization of the cost of the properties. No part of the profits or of the accumulated surplus of the plantation companies has been included in the consolidated results of the United States Rubber Co.

The company closed the year in a strong financial condition, as indicated by the balance sheet, and as to inventories of finished goods and raw materials, including forward commitments, is in a favorable condition.

The consolidated general balance sheet shows:

CURRENT ASSETS	
Cash	\$ 11,654,598
Accounts and notes receivable from customers	43,910,426
Accounts, notes and loans receivable, others	2,010,978
Finished goods	42,479,618
Materials and supplies, including goods in process.....	25,080,359
Total current assets.....	\$125,135,970

CURRENT LIABILITIES	
Bank loans	\$38,235,000
Accounts payable, including acceptances payable for importation of crude rubber.....	12,203,475
Total current liabilities.....	\$50,438,475

MURPHY TO RACE MAY 30

INDIANAPOLIS, March 10—Jimmy Murphy has settled rumors that he intends to quit racing by filing his entry for the next 500-mile race. He will pilot a Miller Special.

Plane Maker Opposes Government Methods

Private Incentive Is Taken Away,
President of Curtiss Company
Declares

NEW YORK, March 10—Reporting to his stockholders total assets of \$5,564,248, including cash of \$246,091, and accounts and notes receivable of \$474,427, with a surplus of \$225,558, President C. M. Keys of the Curtiss Aeroplane & Motor Co. criticizes the methods of the United States Government in handling airplane matters.

He claims that these methods tend toward the "elimination of private incentive," and that because of this it is "obviously necessary under these conditions to cease creative efforts and abandon definitely the policy to regard every experimental contract as a cooperative effort with the Government, and to accomplish the result sought after, regardless of the cost to your company."

No Patent Protection

Among the charges made by Mr. Keys is that there is no patent, copyright or trade-mark protection to the creator of airplanes. He declares that patent protection, surrendered during the war for the nation's benefit at the request of the Government, never has been restored. It is his belief that the outlook for the entire airplane industry is "vague and uncertain," and he goes into details as to his views in the matter.

He says:

First, we are meeting with a sharp increase in direct competition with our own Government in production carried on in Government operated plants. Second, it appears to be a settled policy of the Government whenever possible to buy airplanes below the cost of production, and in no case to permit a percentage of profit on production orders to be higher than the customary formula in the manufacture of articles of standard type for which there is a constant demand. Third, there is a strong tendency toward a governmental monopoly of engineering and development work and the constant elimination of private incentive.

In view of these conditions a large proportion of capital invested in the airplane engineering industry at the end of the war has been either destroyed or driven out of the industry, and, so far as we know, practically no new capital has embarked in the industry or is now available for it.

Development Work Unprofitable

Development work, Mr. Keys says, does not lead to substantial contracts and often, he asserts, capital spent in this way leads to losses instead. Continuing, he says:

As soon as new standards are set, at great expense in effort and in money by private companies, their accomplished successes are immediately copied by others who have no great engineering expense to absorb. Consequently, units in the industry organized solely for small production work can and do sell products below the cost of the original

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House Accepts Offer of Ford for Shoals

Bill Passed in Practically Original
Form—Measure Now Goes
to Senate

WASHINGTON, March 10 — Henry Ford's offer for Muscle Shoals, made to Congress more than two years ago, was accepted in the House today by a vote of 227 to 142. The measure was sent immediately to the Senate where it may or may not receive favorable action.

Under the bill here is what Mr. Ford will do at Muscle Shoals, according to his testimony before the House Ways and Means Committee and under the provisions of the contract:

Manufacture a minimum of 40,000 tons of nitrate for fertilizer annually and sell it to farmers at a profit not greater than 8 per cent.

Purchase nitrate plants 1 and 2, and the Waco Quarry, paying the Government \$5,000,000.

Complete dams 2 and 3, providing water for production of power and lease dams 2 and 3 for 100 years, the lease to be granted to a \$10,000,000 corporation formed by him.

Pay the Government \$1,000,000 a year for five years as a 4 per cent rental on the Government's expenditure of \$80,000,000, plus \$55,000 for maintenance and repair.

The House had the measure under debate for a week continuously and passed it in practically the same form as it was reported out of the Military Affairs Committee, before which Ford and his engineers testified.

Amendments Voted Down

Altogether during the process of debate more than 140 amendments to the measure were offered, virtually all of them being voted down. To the last, advocates of the Ford offer successfully prevented attempts to modify the proposed contract. The measure as passed carried less than half a dozen amendments, all of them of minor importance.

One of the hottest fights on the bill was the attack on the Madden amendment, approved by the Military Affairs Committee, which obligates the Government to replace the Gorgas steam power plant, recently sold to the Alabama Power Co. The replacement will cost \$3,472,487 and arguments were made that Ford should replace this at his own cost.

Under the terms of the bill Ford will have the right to lease for 100 years dams 2 and 3 at Muscle Shoals and adjacent power stations. Opponents to the measure made a desperate but futile effort to have the contract under the terms of the Federal Water Power Act, thereby limiting the lease to fifty years, and to provide for the recapture of the project should Ford fail to live up to his contract in any particular.

Party lines were totally disregarded and any mention made of Ford's inten-

GARMENT MAKERS SAY CARS HELP BUSINESS

NEW YORK, March 12—Instead of cutting down the amount of money they spend for clothing, people are actually spending more for apparel since the automobile has come into general use, according to a bulletin of the International Association of Garment Manufacturers.

"No man or woman is going to climb into a shiny new car wearing a worn, shiny suit of clothes or an out of date hat," states this report. The bulletin points out that the increased contact between town and farm due to motor travel has improved the market in farming sections.

The increase in the use of country clubs made possible by the automobile has stimulated the demand for sport clothing. The use of camping togs and the wear and tear on clothing through more active outdoor life are other ways in which, in the opinion of the association, the automobile is promoting larger sales of clothing.

tion to make automobile or tractors at the plant brought much applause from both contingents in the House.

The first fight in the Senate over the bill will be over its reference to a Senate Committee. Senator George W. Norris of Nebraska, chairman of the Senate Agriculture Committee, will seek to have it before his committee for hearings. In view of his bitter opposition to the measure, however, Southern Senators, who are supporting the legislation, will strive to have the bill referred to a committee which they regard to be more friendly to Mr. Ford.

Northway Indebtedness Removed Through Merger

NATICK, MASS., March 11—More than 600 stockholders attended the annual meeting of the Northway Motors Corp. and its affiliated companies, which approved the new directorate, following which the board named Proctor W. Hansl as president of all the Northway companies, C. W. Blackman, vice-president, and Robert Bursner, treasurer.

The stockholders were informed that practically the entire indebtedness of the Northway companies has been liquidated by means of funds provided under the merger plan recently submitted to stockholders and that operating expenses had been materially reduced.

Mr. Hansl stated that less than 40 per cent of the stockholders would fail to take advantage of their rights under the consolidation plan. A consolidated financial statement of the Northway companies, which was submitted, showed net physical assets amounting to \$1,366,587 in excess of liabilities.

Mack Trucks Earned \$20.71 Share in 1923

Compares with \$9.94 in 1922—
Gross Sales for Year Placed
at \$43,866,957

NEW YORK, March 11 — Sales of Mack Trucks, Inc., in 1923 increased 41 per cent over 1922, according to the company's annual statement, which reports gross sales of \$43,866,957, against \$31,070,289. Net income was \$7,003,665 as compared with \$3,952,279, which is equal to \$20.71 a share on the common stock outstanding, compared with \$9.94 in 1922.

Net profits totaled \$8,053,665, against \$4,027,531, but these were reduced to \$7,003,665 by the payment of Federal taxes of \$1,050,000. Payment of \$2,577,891 left a surplus of \$4,425,774.

The company's balance sheet as of Dec. 31, follows:

ASSETS		
	1923	1922
Cash	\$ 3,533,016	\$ 4,231,044
Accts. and notes rec. less res.	8,994,271	6,245,231
Inventories	15,374,316	12,572,426
Bal. rec. from empls. under stock allotment	1,613,533
Real estate, bldgs., mach., etc., less depreciation	8,610,505	7,931,318
Investments	22,673	16,773
Deferred charges	203,534	175,735
Patents, good will, etc.	2,386,565	2,386,565
LIABILITIES		
Accounts payable.....	\$ 1,485,473	\$ 1,831,216
Accrued accounts.....	1,009,559	612,258
Customers' deposits..	105,000	55,657
Res. for Fed. taxes..	1,050,000	568,715
Res. for contin., including war amortization	1,085,083	792,535
Equity of minority stockholders, incl. subsidiaries	56,269	37,759
Stated capital.....	17,869,700	17,869,700
Capital surplus.....	7,882,850	6,023,455
Earned surplus.....	10,193,573	5,767,799

In a letter to the stockholders, President A. J. Brosseau reports that "the use of the bus and the rail car is developing rapidly, and the company is planning to extend the passenger-carrying bus and railroad car operations." This, he said, will lead to enlargement of plant facilities, installation of more machinery and require more working capital.

N. M. A. Clubs Will Meet to Ratify A. A. A. Merger

WASHINGTON, March 12—Ratification of the National Motorists Association's consolidation with the American Automobile Association will be taken up by delegates of the former organization at a meeting called by President Walter D. Meals.

The meeting will be held in the Congress Hotel at Chicago, Friday, April 11, at 10.30 o'clock.

Star's Open Models Advanced in Price

Phaeton and Roadster Quoted at \$545—No Change Made in Lists of Closed Cars

NEW YORK, March 10—Star Motors announces an advance of \$50 on its roadster and phaeton models. The new price is \$545, and as the list of the closed models is unchanged, it reduces the differential between the two types of models. The Star list now is as follows:

	Old Price	New Price
Roadster	\$495	\$545
Phaeton	495	545
Sport Phaeton.....	640	640
2-Pass. Coupe.....	640	640
Sedan	785	785
Sport Sedan.....	935	935

Moon Increases Prices \$100 on Complete Line

ST. LOUIS, March 10—The Moon Motor Car Co. has increased the price of its entire line \$100. The new \$995 model "A" phaeton, announced at the New York automobile show, now lists at \$1,095; the "U" phaeton, \$1,395; 6-50 phaeton, \$1,595, and the 6-58 phaeton \$1,885.

	Old price	New price
NEW SERIES "A"		
Phaeton, standard	\$ 995	\$1,095
Special phaeton	1,195	1,295
MODEL 6-40 SERIES U		
Phaeton	1,295	1,395
Sport phaeton	1,495	1,595
Roadster	1,295	1,395
Coupe	1,685	1,785
Sedan	1,695	1,795
Petite Sedan.....	1,895	1,995
MODEL 6-50		
Phaeton	1,495	1,595
Sport phaeton	1,595	1,695
Roadster	1,495	1,595
Coupe	1,885	1,985
Sedan	1,885	1,985
Petite sedan	2,095	2,195
MODEL 6-58		
Phaeton (seven pass.).....	1,785	1,885
Sport phaeton (seven pass.)	1,995	2,095
Sport phaeton (five pass.)..	2,050	2,150
Sedan (seven pass.).....	2,485	2,585
Petite sedan	2,585	2,685

Increase of \$10 to \$80 Made in Maxwell Prices

DETROIT, March 10—Price advances ranging from \$10 on the club coupé to \$80 on the standard phaeton have been made by the Maxwell Motor Corp. No change has been made in the list of the standard sedan and coupé. Chrysler prices also remain the same.

The list now is as follows:

	Old price	New price
Roadster	\$ 795	\$ 875
Phaeton	795	875
Sport Roadster.....	895	975
Sport Phaeton.....	975	1,045
Club Coupé.....	985	995
4 pass. Coupé.....	1,195	1,195

FORD TO SAVE WOOD FOR MAKING CRATES

DETROIT, March 11—Orders have been issued by the Ford Motor Co. to its branches throughout the country to save all wood coming in and to use precautions to see that no board is broken. The company plans to salvage this wood, investigation having disclosed that 89 per cent of the wood now thrown away by Ford branches as useless can be used.

The company's lumber salvage department at the plant here has been experimenting for the past month and has discovered that where thirty-six carloads of wood were taken away each week as useless, except for firewood, thirty of these carloads can be utilized. The salvaged wood can be used for boxes and crates. Tests have shown that 93,000 board feet of lumber can be salvaged each week.

Club Sedan	1,045	1,095
Sedan	1,295	1,295
Travellers' Sedan	1,585	1,585

It is announced that Maxwell sales in January and February totaled 6369, an increase of 25 per cent over the 1923 period.

The 1000th Chrysler was turned out March 6. The March schedule calls for 2000 or at the rate of 100 a day for the greater part of the month.

Wilson Body President Dies at St. Petersburg

DETROIT, March 10—Charles R. Wilson, president of the C. R. Wilson Body Co. of this city, died Friday night at his winter home in St. Petersburg, Fla., aged eighty years. Mr. Wilson was a carriage builder of national reputation before he became identified with the motor industry, in which he was a prominent factor for many years.

Mr. Wilson built bodies for Ford, Cadillac and Oldsmobile in their pioneer days, developing the business until today the company is operating a big body plant in Detroit and a woodworking plant in Bay City.

He was born at Coburg, Ont., and after engaging in the grocery business, came to Detroit and began, in 1875, the manufacture of buggy woodwork.

CHANGES WITH JOHNS-MANVILLE

NEW YORK, March 10—H. E. Manville has succeeded T. F. Manville as president of Johns-Manville, Inc., the latter becoming chairman of the board. T. F. Manville formerly was vice-president. In addition to this change, J. R. Hoff, W. R. Seigle, J. E. Meek, J. W. Perry and J. S. Carroll have been elected vice-presidents. The executive committee is made up of T. F. Manville, H. E. Manville, L. R. Hoff and W. R. Seigle.

Hayes Wheel Netted Profit of \$1,302,066

Sales for Year Ended December 31 Reported to Have Reached \$19,740,000

DETROIT, March 12—The annual report of the Hayes Wheel Co. shows a net profit of \$1,302,066 for the year ended Dec. 31 last. Sales aggregated \$19,740,000 comparing with \$13,500,000 the year before. From net profit was drawn \$591,132 for dividends, leaving \$710,934 as the 1923 surplus. Total assets aggregate \$9,158,000, an increase of about \$2,000,000.

Current assets aggregate \$5,132,000 including \$660,000 in cash, \$2,660,000 and \$1,700,000 in receivables. Current liabilities approximate \$1,800,000. Total profit and loss surplus is \$4,031,397.

Sales for the year in terms of units were 50 per cent higher than any previous year, declares President C. B. Hayes. Dollar value of sales, however, did not increase proportionately, reflecting the keener competition that has prevailed in the automotive industry.

Referring to the proposed purchase of the Hayes Truck Wheel Co., Albion Bolt and Morrison Metal Stamping, Mr. Hayes said the combined earnings of these companies on the basis of last year's business and present operations are about \$700,000 annually before Federal taxes. Dividend requirements of the preferred stock proposed to be issued is \$137,000. In addition to increased earnings available the company would be in position to meet future competition through control of manufacturing of all component parts.

Sales for the first two months of the year show an increase of one-third over the same two months last year, Mr. Hayes said.

Demand for Trucks Shows Steady Rise

(Continued from page 634)

greatest gain has been in the use of railroads for moving cars from factories to distributing areas. This method of transportation has proved very satisfactory. Carload shipments of cars and trucks in February amounted to 49,219 as against 43,000 in January.

An increase in the number of drive-aways is expected this month and beginning with April it is likely that a greater number of shipments will be made by boat, although heaviest shipments by this means will not be made until May, with a gradual increase from then until September.

The parts branch of the industry is continuing in a strong position, with operations at a high point and collections remaining on a satisfactory basis.

Durant Drops Eagle; Produces New Flint

First Model Exhibited at Boston
Show—Standard Phaeton
Priced at \$980

BOSTON, March 10—The Flint 40, a new and smaller model of the Flint, is being displayed at the Boston show, its debut having been reserved for this occasion. The new member of the Durant family takes the place of the Eagle, which was announced a year ago and which never has been in production. The Eagle was to have been made by the Locomobile unit, of which the Flint is a part, but it has been decided to abandon the Eagle and substitute the new Flint model.

The Flint 40, which is to sell at \$980 for the open model, will be manufactured in two places—at Flint, Mich., by the Flint Motor Co., and at Long Island City, N. Y., by the Flint division of the Locomobile Co. of America.

Specifications of Model

The new model has a bore of $3\frac{1}{4}$ and a stroke of $4\frac{1}{4}$ in. (195.6 cu. in.) and is said to deliver 48 hp. at 2400 r.p.m. The six cylinders are cast in a block with the upper half of the crankcase. The valves have a diameter of $1\frac{1}{2}$ in. and a lift of $\frac{5}{16}$. Connecting rods have an $8\frac{1}{4}$ in. center to center length and have the lower bearing cast in. The dimensions of this bearing are 2 in. diameter by $1\frac{1}{4}$ in. width.

The crankshaft is of the four-bearing type, all bearings being 2 in. in diameter. The front bearing is $1\frac{1}{2}$ in. long; the two intermediates ones are $1\frac{1}{4}$ in. and the rear bearing is $2\frac{1}{2}$ in. long. The camshaft also has four bearings.

Lubrication is by pressure from a gear type oil pump direct to all main bearings and through the drilled crankshaft to the crankpin bearings. The cooling system comprises a Fedders radiator and a 16-in. four-blade fan, the water capacity of the system being 3 gal.

Tillotson Carbureter Used

A 1-in. Tillotson carbureter is used and is directly connected to the combination inlet and exhaust manifold on the left of the engine. Camshaft drive is by a Morse silent chain. The electric system is of Autolite make, including the ignition outfit, while the battery is a U.S.L. of 92 amp.-hr. capacity.

The clutch is a single plate type, inclosed in the flywheel, and the gearset a Warner three speed, which is mounted separately on the frame. Left-hand drive is used, the spark and throttle levers being mounted on the steering wheel and the ignition and lighting switches within easy reach on the instrument board.

The rear axle is an Adams semi-floating type with a $4\frac{7}{9}$ reduction ratio. Four-wheel brakes of the double shoe type are fitted. All four can be oper-

IOWA FARMER SETTLES HIS POST-WAR DEBTS

DAVENPORT, IOWA, March 11—The annual March settlements now being made are generally accepted by Iowa bankers and commercial interests as the clean-up of the post-war inflation period and its consequent depression. Settlements have meant foreclosures for many who were too heavily in debt, and several loss write-offs have occurred, but on the whole the situation is regarded with less alarm and the future is viewed more optimistically than for several years.

The post-war record, bankers say, has shown losses to be the rule rather than the exception, and every line of activity in Iowa has felt this. The current year, however, has seen the last of these. Farmers are starting out on less ambitious programs, perhaps, but with more certainty of their future, and business, although on a smaller scale, is more basically sound than for many years.

ated either by pedal or hand lever. All springs are semi-elliptic, the front springs being 35 in. long and the rear $50\frac{1}{2}$ in. Chassis lubrication is by the Alemite system. Balloon tires of the 4.40 in. size are fitted to 20 in. disk steel wheels. The steering gear is of the Warner worm and gear type, with 16-in. handwheel.

The pressed steel frame has a channel section of $4\frac{1}{2}$ in. depth and $\frac{5}{32}$ in. stock. Fuel is carried in a 12-gal. rear tank and supplied to the carbureter by the Stewart vacuum system. The wheelbase is 115 in. Barrel-type nickel-plated and black-enameled headlamps with Flat Lite reflectors are furnished. The horn is motor-driven.

Ward Producing Trucks Without Battery Cradles

MOUNT VERNON, N. Y., March 10—The Ward Motor Vehicle Co. is now featuring some of its electric truck models without battery cradles.

These are to be offered at a slightly lower cost, the weight is less and the trucks require less garage space. Other advantages claimed are greater ground clearance, lower frame, more accessible battery and slightly increased battery size.

STEINMETZ SEEKS \$300,000

BALTIMORE, March 10—Efforts are being made by the management of the Steinmetz Electric Motor Corp., now in a receivership, to raise \$300,000 working capital. Of this amount stockholders are asked to advance \$60,000 on three-year 7 per cent gold coupon notes, while the remainder would be obtained from other sources.

Bigger Citroen Car Has 4-Wheel Brakes

Otherwise General Design Is Same
as That of Present Four-
Passenger Model

PARIS, March 1 (by mail)—A bigger and more powerful Citroen car will be added to the two models now produced by this French concern and will be shown to the public for the first time at the October show and is expected to be in production for 1925.

The new Citroen has a four-cylinder L-head engine of 80 by 140 mm. (3.1 by 5.5 in.) bore and stroke, and while of the same general design as the present four-passenger car, will differ from it in having four-wheel brakes. The car is being planned to be built on a big production basis, but in order not to interfere with the present models, an independent factory will be used.

Probably the Mors factory, which is in the hands of the Citroen company, will be remodeled for this purpose. The selling price of this six-passenger model has not been announced.

In future all Renault models, from the biggest to the smallest, will be equipped with four-wheel brakes. Up to the present the smallest of the models built by this firm, a two or three-seater with a four-cylinder engine of 58 by 90 mm. bore and stroke, has been produced with rear wheel brakes only. It is intended to bring it into line with the others by adopting the Perrot type front wheel brake.

Hotchkiss has secured land at St. Ouen, near Paris, on which a new factory will be erected for the production of a 10 hp. light car, which it is expected will be ready for the market next spring. H. M. Ainsworth, who was in charge of the Coventry works of the Hotchkiss company until it was sold to the Morris company, is now in full technical charge of the Hotchkiss automobile works in France.

New Reo Special Phaeton to Replace Former Model

DETROIT, March 12—Deliveries by Reo Motor Car Co. during February were 40 per cent in excess of the same month last year, according to a factory statement. Taxicab business has been increasing rapidly since the new six-cylinder model was exhibited, the company declares, and this increase has helped materially in establishing the new February mark. Enough orders for the new six-cylinder bus were taken during the national shows to insure capacity production on this model for several months.

It is also reported that the new T-6 special phaeton model just being announced will be in production immediately. This model, carrying balloon tires as standard equipment, replaces the Reo phaeton in the passenger car line.

Line of Accessories Now Carried by Olds

Follows Its Parts Policy—Flat Rates Will Cover Cost of Installation

DETROIT, March 10—A line of certified accessories is now being handled by the Olds Motor Works of Lansing, Mich., in accordance with a similar service parts policy. These accessories, which include all of the conventional units, are priced at a flat figure over the entire country, the freight and war tax charges having been absorbed.

It is planned to cover the installation of any of these accessories by a flat rate charge, such as is used in all Olds service operations. All of the accessories which are included in the line are standard equipment on the Olds sport phaeton model and have been adopted after tests which insured their merit.

Each of these units is shipped from the factory, where it has undergone a regulation inspection routine in the same manner as the more usual mechanical parts of the car. In addition to these features, all cars are shipped with the necessary mounting facilities so that the accessory becomes an integral part of the car as it is installed. This provision also tends toward reduced installation outlay and time requirements.

Accessories Included

Included among the certified list of accessories are the following with their respective prices: Front bumpers, \$15; rear standard bumper, \$15; rear sport bumper, \$15; bar handle radiator cap, \$2.50; road spotlight, \$5; windshield cleaner, \$1.25; rear view mirror, \$1.75; step plates, \$4.75 per pair; steel enameled trunk, \$25; trunk platform, \$7; trunk rails, \$6.80 a set of four; windshield wings, \$17 a pair, and a sport tire carrier assembly, \$7.50.

It is stated that these prices, plus the flat rate installation charge, will bring the total cost well below the usual market price with the added advantage of integral characteristics.

Bates Tractor Solvent, Asserts Its President

JOLIET, ILL., March 11—W. O. Bates, Sr., president of the Bates Machine & Tractor Co., against which a petition of involuntary bankruptcy was filed by three Chicago creditors last week, has denied that the company is insolvent. He says:

Our assets are in excess of \$1,600,000 and our liabilities less than \$500,000 but prolonged depression of the agricultural market has depleted our cash reserve and this is responsible for our present situation. The company recently began manufacture of the caterpillar tractor for road building but owing to the magnitude of requirements to furnish the necessary machines ordered a reorganization was necessary to make way for proper financial support.

The three petitioning creditors, Trojan and Lafayette Coal companies of Chicago and Wieman Brothers, an insurance firm, filed total claims of \$1,100, and set up that the payment Feb. 13 of \$245 to the Service Fuel Co. of Joliet was showing a preference to creditors when the company was insolvent. The Bates company was organized in 1882 with \$20,000, but has grown to a \$400,000 corporation. In 1914 it began tractor manufacture.

Aircraft Company Sues on Accelerator Patent

TOLEDO, March 10 — The United States District Court of the Northern District Division of Ohio has granted an immediate injunction and ordered an accounting in favor of the Williams Brothers Aircraft Corp. of San Francisco against the Michon Accelerator Co. of Toledo, now known as the J. H. M. Michon Co. The Pacific Coast concern claims infringement of its patent, No. 1,284,523, covering the Williams accelerator for Ford cars.

J. H. M. Michon announces that he is making preparations to appeal the decision and intends to ask for a stay of injunction.

Zapon Company Formed to Operate in France

PARIS, March 1 (by mail)—A French Zapon Co., registered under the title Societe Francaise Zapon, has just been formed with a capital of 9,200,000 francs and offices at 27 Rue de Constantine, Paris.

The company has been formed as the result of an agreement between the Zapon Leather Cloth Co. of Stamford, Conn., and the Blanchisserie et Teinturerie de Thaon, which has a factory at Croissy, near Paris, in which Zapon leather cloth will be manufactured.

While specializing in fabric leather cloth for automobile use, the company will meet the requirements of other trades. The directors comprise the Blanchisserie et Teinturerie de Thaon, George Lang and Leon Binoche.

Standard Welding Plant May Be Sold for \$550,000

CLEVELAND, March 11 — Andrew Squire, lawyer of this city, has bid \$550,000 for the Standard Welding Co. plant of the Standard Parts Co. and the probabilities are that it will be sold to him on March 15.

Sale of this plant will bring the amount paid to creditors to approximately 75 per cent. The creditors of the Standard Parts thus far have received 68.5 per cent.

The Standard Welding Co.'s property consists of eight acres of land between west Seventy-third and West Seventy-sixth Streets, adjoining the New York Central tracks. It is improved with a building having a floor area of between 400,000 and 500,000 square feet.

Others desiring to bid on this property have until March 15 to submit offers.

Consider Organizing Motor Truck Owners

Buses Also Would Be Included in National Association That Has Been Proposed

NEW YORK, March 10—Motor truck manufacturers, members of the National Automobile Chamber of Commerce, held their quarterly meeting last week, devoting their time to discussing the excise tax battle at Washington, the coordination of railroads and trucks, the need of encouraging owners of trucks and buses to organize in order that legislative battles may be fought more successfully, and listening to Dr. Albert Sommer of Dresden, Germany, executive manager of the German Motor Fuel Corp.

Committee Appointed

A committee of three will be appointed to confer with the truck manufacturers and the Motor Vehicle Conference Committee as to the advisability of fostering organizations of owners of trucks and buses. It is thought that with the right sort of cooperation a national organization can be perfected similar to the American Automobile Association, but made up of truck and bus owners.

With such an organization it would be possible to secure a hearing when matters of importance in the way of legislation and roads come up for settlement.

The trend toward the use of trucks by railroads and the possibility of a consequent largely increased market for trucks in this field was discussed. There also was a discussion of problems arising from the overloading and overspeeding of trucks and buses.

Dr. Sommer's remarks were listened to with great interest, especially when he told of the development of cooperation between railroads and trucks in Germany which, he said, involves the use of trucks to replace local freight trains, similar to plans put into effect recently by the New York Central and Pennsylvania Railroads in this country.

Railroad Use a Success

"About one year ago the use of trucks by railroads in the city of Berlin began and today can be pronounced a thorough success," said Dr. Sommer. He added that trucks are used to avoid "trap rock" service between freight stations in various parts of Berlin. Each individual truck unit consists of a five-ton motor truck and two trailers, all closed like freight cars, operated and guarded by the truck corporation's men, who for this business are under the orders of the railway management and wear the railway uniform.

The truck corporation acts as joint carriers with the railroad and receives a tariff proportionate to the prevailing railroad tariff. Through the use of trucks about forty railroad cars are saved for long haul purposes in Berlin alone.

Men of the Industry and What They Are Doing

Tuerk Now with Haynes

Fred S. Tuerk has been chosen advertising and sales promotion manager of the Haynes Automobile Co., joining the Kokomo concern after several years with the advertising and sales department of the B. F. Goodrich Co. at Akron.

McCrea Succeeds Wheelock

A. F. McCrea, Detroit, formerly with the Brotherton advertising agency in that city, has been made advertising manager of the Velie Motors Corp., succeeding Henry T. Wheelock. He has had wide experience in the automobile publicity line. He is a former New England and Washington, D. C., newspaper man.

Mahler Is Westcott Export Head

P. M. Mahler, who resigned as export manager of D. J. Murray Manufacturing Co., Wausau, Wis., has been appointed to a similar position with the Westcott Motor Car Co., Springfield, Ohio.

Chevrolet Appoints Gardner

R. B. G. Gardner has been appointed assistant advertising manager of the Chevrolet Motor Co., in charge of production of advertising matter, L. K. Austin continuing as assistant advertising manager in charge of division operations, purchasing and circularizing. Mr. Gardner was formerly assistant secretary of the Association of National Advertisers, New York.

Feiss with Juhasz Carbureter

John Feiss, formerly sales manager of the New York branch of the Vogue Tire Co., has resigned to become manager of sales of the Juhasz Carbureter Corp.

Changes in Moon Staff

W. R. Brashear, who has been factory service manager for the Moon Motor Car Co. for several years, has been added to the sales department and is succeeded by Hiram Neuwochner, assistant purchasing manager. W. D. Nansen of the engineering department has been made assistant purchasing manager.

Gamble Located in Detroit

D. E. Gamble, chief engineer of the Borg & Beck Co., will be located in Detroit in the new Borg & Beck offices, which have been opened in the General Motors Building.

Saalfeld Is Sales Manager

R. S. Saalfeld has been appointed sales manager of the Star Rubber Co., Inc., Akron, Ohio. He joined the Star company in 1922 as assistant treasurer and was later made treasurer. Mr. Saalfeld formerly was with the Goodyear Tire & Rubber Co. For four years he served in the Far East, having charge of the

Singapore and Ceylon offices. From 1919-1922 he was special representative of Goodyear's tire department.

Dunn Rejoins Willys-Overland

H. L. Dunn, formerly purchasing agent of Willys-Overland, who resigned to join Clarence Earl in the Briscoe and Earl companies, and who later was a member of the National Motors executive staff, has rejoined the purchasing department of Willys-Overland.

Priebe Joins Keller Staff

C. J. Priebe has joined the sales organization of the Keller Mechanical Engineering Corp. of Brooklyn. For the last four years he has been engaged in editorial and advertising work for the American Machinist.

Crawshaw in Charge of Branch

O. W. Crawshaw has been appointed manager of the new direct factory branch which the General Motors Truck Co. has opened in Cleveland. Mr. Crawshaw also will continue as district sales manager of the company.

Eddins to Assist Dawson

D. S. Eddins, formerly regional sales manager of the Atlantic Coast region for the Chevrolet Motor Co., has been appointed assistant general sales manager, succeeding C. E. Dawson, promoted to acting general sales manager. Mr. Eddins has been associated with Chevrolet for the last five years. His first position was as sales manager of the Denver zone, which he held for three and a half years, when he was made sales manager of the Tarrytown zone, and on Nov. 15, 1922, he was made regional sales manager of the Atlantic Coast.

Jones Takes Jennings' Place

J. W. Jones has been appointed secretary of committees of the Automotive Equipment Association, Chicago, succeeding J. Ross Jennings, who resigned to become field secretary of the Motor and Accessory Manufacturers Association, New York City, following the selection of A. W. Barber, the former field secretary, as trade observer. Mr. Jones for a number of years was private secretary to Nels Gross, president of the L. Wolff Manufacturing Co., Chicago, maker of plumbing supplies.

P. A. Tanner Resigns

P. A. Tanner has resigned as vice-president and sales manager of the Johnson Motor Co. of South Bend, Ind. Mr. Tanner formerly was for some years with the Splittdorf Electrical Co. in various capacities, which included secretary and director of branches.

Jefferson Named Advertising Manager

G. C. Jefferson has been appointed advertising manager of the Mansfield Tire & Rubber Co. of Mansfield, Ohio. Mr. Jefferson formerly was with the Oakland Motor Car Co. and more recently was in charge of the South Bend office of Dorrance, Sullivan & Co.

Ohmer Fare Register Co. Buys American Taximeter

DAYTON, OHIO, March 10—The Ohmer Fare Register Co. of this city has acquired the entire business of the American Taximeter Co. of New York and the products of both companies will be manufactured in the Ohmer company's Dayton plant.

Both concerns make fare-recording devices, the Ohmer company starting in 1902, while the American Taximeter Co. is the result of the consolidation in 1910 of the Jones Taximeter Co. and the Franco-American Co.

Francis Ducasse, its president, is credited with being the first to import into this country French taximeters of the Popp make, installing them on Darracq taxicabs operating in New York in 1907. Since then, Ducasse's company has built and distributed the Jones, Popp and Atco taximeters.

The Ohmer devices differ from the machines of the American Taximeter Co. in that they are receipt-issuing and printing, whereas the others are registering, but non-printing taximeters.

Order Issued by Court in Parenti Motor Sale

BUFFALO, March 12—An order to show cause why the assets of the Parenti Motor Co. should not be turned over to the Hanover Motor Car Co. upon the payment of the balance due on the purchase price has been signed in Federal court by Judge John R. Hazel.

The Parenti company was sold to Hanover for \$227,500, a payment of \$45,000 having been made at the time of purchase. The Marine Trust Co., as trustee of the Parenti company, is named in the order.

The court has also signed an order to show cause why the assets of the company should not be resold.

BURPEE-JOHNSON RECEIVER

INDIANAPOLIS, IND., March 10—The Aetna Trust & Savings Co. of this city has been appointed receiver of the Burpee-Johnson Co., manufacturer of shock absorbers and other automobile accessories, on a suit brought by Richard E. Elliott, with a claim of \$1,980. Mr. Elliott has been sales manager for a number of years. The court authorized the receiver to operate the plant.

Boston Show Orders and Attendance Big

Fewer Factory Men Are in Attendance, but Great Number of Outside Dealers

BOSTON, March 11—Large crowds are attending Boston's annual automobile show which opened Saturday, although attendance was cut down on Tuesday by a semi-blizzard. There are fewer factory men present than in other years, but more outsiders. This latter is due to the fact that the territory is being combed for more sales outlets.

Salesmen say that the orders so far have been very good. The trend toward open cars that manifested itself early in the fall is still in evidence. Apparently this is due to the fact that many first buyers have decided on that type rather than wait until they can afford a closed model some years later.

The show, however, proves the dominance of the closed types, there being 173 of them to 149 of the open. These are scattered among sixty-six different makes. There are thirteen exhibitors in the Copley Plaza salon.

The fact that New England dealers are not stocked up heavily will mean more factory orders this week, because these men, feeling the momentum of sales at the show, will be encouraged to book cars when the dealer dinners are held. At the dinners that have already taken place, this optimism has made itself felt, and what factory men are here are well pleased with results.

When they learned about the great increase in savings deposits in New England over a year ago, totaling at least \$150,000,000, dealers are reasoning out that there is every reason to expect a big increase in car sales this year.

Plane Maker Opposes Government Methods

(Continued from page 637)

creator of the type of engine, plane or accessory involved.

Any important development, such, for example, as the new wing on the Curtiss Racer of 1923, developed at the expense of your company, is immediately broadcast to the trade by the Government, so that thereafter the value of the invention ceases to the inventor and inures, if at all, to the lowest bidder on construction contracts.

Taking as a specific case an advanced type of plane for the use of the United States Navy, your company, overcoming new and unexpected problems involved in the experimental contract, spent several hundred thousands of dollars of its own funds and produced a ship superior in important characteristics to any other of its type ever constructed. Nevertheless the proprietary rights were reserved by the Government, and it now appears likely that a quantity order for these ships will be offered to public competition; so that the fruit of our expenditure may be gathered by those who do not risk capital to accomplish advances in the art on behalf of your Government.

The balance sheet of the company, as of Dec. 31, 1923, is as follows:

Assets: Property account, \$1,878,802; patents and goodwill, \$1,365,885; investments, \$53,800; inventories, \$1,167,161; accounts and notes receivable, \$474,427; cash, \$246,091; investment in loans, \$300,000 and deferred charges \$78,081.

Liabilities: Mortgages payable, \$1,530,000; accounts payable, etc., \$345,479; reserve for Federal taxes, \$1,793; preferred stock, \$2,523,150; common stock, \$938,268 and surplus \$225,558.

Loening Makes Reply

NEW YORK, March 11—Grover Loening of the Loening Aeronautical Engineering Corp. has answered the criticisms against the Government made by C. M. Keys, president of the Curtiss Aeroplane & Motor Corp. In a letter to Mr. Keys, Mr. Loening declares that conditions within the industry itself are more responsible for the present condition of the aeroplane manufacturing business than the course taken by the Governmental departments.

Mr. Loening states that the Curtiss company collects royalties from other concerns in the business through its patents. He denies that the Government is eliminating private incentive in experimental work and says that the Government aids and encourages the industry.

Continuing, he offers six constructive suggestions:

That the Government be relieved by Congress of the necessity of placing the business on a bidding basis.

That contracts be placed to include flight testing as well as construction, so work can be completed under the eyes of the originator.

That the basis of square footage of plants be not considered in the awarding of contracts.

That the Government prescribe a preferred list of constructors with whom it will deal and among whom it will divide its business.

That five or ten year development programs be adopted by Congress.

That Government aviation be enlarged not only as to mail carrying but by the operation of a net work of passenger air lines over the country, "giving machines and pilots a definite use and object in peace time and yet instantly available as a reserve in time of war."

French Assembled Ford Has Some Modifications

PARIS, March 1 (by mail)—Public announcement was made this week of the European type Ford, as assembled at the Bordeaux factory for the French market.

The modifications are a lower center of gravity, a higher and bigger nicked radiator, new running boards covered with linoleum and bordered with aluminum, a slip-on cover for the top, deeper and more inclined back rests, and a new carbureter declared to give 24 miles to the American gallon.

With electric lighting and starting and detachable rims the Ford phaeton is now listed at 13,200 francs, this making it the lowest priced four-passenger car on the French market.

Hudson to Produce 7-Passenger Sedan

New De Luxe Model Is Mounted on Standard Super-Six Chassis —Priced at \$2,145

DETROIT, March 11—The Hudson Motor Car Co. announces a seven-passenger de luxe sedan, listing at \$2,145. It is mounted on the standard Hudson Super Six chassis.

The new body, like that of the five-passenger sedan, is made by Biddle & Smart. It is 1½ in. longer than the five-passenger and has two folding auxiliary seats, which are of conventional type. The angle of the front seat back has been changed slightly to provide additional room for the auxiliary seats.

Finish of the new model is in Hudson blue, with a double hairline stripe of lighter shade of blue just below the molding. Fenders and radiator shell are in jet black. Upholstery is in a rich mohair plush and fittings include arm straps, robe and foot rails and dome light. Cushions are somewhat deeper than in the five-passenger sedan. The rear floor is carpeted. Equipment includes visor, cowl ventilator, cowl or parking lamps, and a lock on the right front door, with inside bolts on the other three doors.

Windows are rounded slightly at the corners, and are somewhat longer and lower than in the five-passenger sedan, giving the impression of greater length and decreased height to the car. Rear and rear quarter windows have silk curtains. Door windows are raised and lowered by crank type regulators, and the rear quarter windows by thumb-latch type lifters, two to each window. All doors open toward the front and are substantially hung on four hinges.

Wood wheels are standard equipment on this model, but disk wheels of the demountable rim type may be had at \$25 extra.

Stockholders Advised to Buy McGraw Factory

CLEVELAND, March 12—Stockholders of the McGraw Tire & Rubber Co., now in the hands of a receiver, have been advised by a committee appointed to protect their interests that their only salvation lies in purchasing the plant at receiver's sale. If that is done, the stockholders may either resell it at a profit, if possible, or reorganize the company and operate it.

The protective committee has put the proposition squarely up to the stockholders in a letter that has been mailed. The letter sets forth that liquidation of the company for the benefit of creditors is about completed and that most of the accounts have been paid in full. There still remains about \$511,000 due creditors, a small portion of which can be raised from liquidating the remaining current assets.

Dimmed Lights Held Detriment to Safety

N. A. C. C. Committee Makes Recommendation—It Also Drafts Impounding Law

NEW YORK, March 10—In the opinion of the Traffic Planning and Safety Committee of the National Automobile Chamber of Commerce, which held a meeting here following the quarterly session of members of the N. A. C. C. last week, the dimming of headlights should be discouraged as an aid to reducing the number of automobile accidents and increasing the safety of the highways.

This radical recommendation, which was adopted by the committee, is favored on the theory that all headlights should be properly adjusted, thus making dimming unnecessary; that the variation of lights caused by alternately dimming and turning on full force confuses the driver of the approaching vehicle, and that dimming tends to make drivers careless in watching their lights.

Merely a Recommendation

The recommendation carries no legal weight—it simply is the view of the committee and could not be put into force because in many States there are laws which demand that headlights be dimmed when another vehicle approaches. It is in line, however, with what some of the officials of the Bureau of Standards at Washington are reported to think would reduce the number of road accidents, although the Bureau has not taken official action on the question.

Chairman George Graham and his associates, Alvan Macauley, E. S. Jordan, A. B. C. Hardy and George H. Pride, also approved a special law for the impounding of motor vehicles which it has drafted to meet the views of the committee in this important innovation, which was first announced by Chairman Graham at the highway conference in Ann Arbor, Mich., recently. This specimen law will be distributed by the committee for the guidance of State legislatures which may think well of the idea and desire to adopt a measure that will put the idea into legal form.

Permits Other Punishment

The proposed law reads as follows:

Upon the conviction of any person, firm or corporation or agent or servant of any person, firm or corporation while performing his principal's or master's work or duty, of an offense in any court of this State where a motor vehicle was unlawfully used or operated in the commission of such offense, the court may in addition to all other punishment and penalties prescribed by law prohibit the use of the motor vehicle during a period to be fixed by the court.

The officer executing the sentence of the court shall seize said motor vehicle and impound and detain the same in such manner as the court may prescribe, and said motor vehicle shall not be released until all

fees and expenses approved by the court for the seizure and detention of said motor vehicle shall have been paid.

If such fees and expenses are not paid within ten days after the same have been approved by the court, such motor vehicle shall be sold at private or public sale, as may be directed by the court, and the officer making the sale, after deducting the expenses of impounding and detaining the property, the fees for the seizure and the costs of the sale, shall pay all liens according to their priorities which are established by intervention or any other proceedings brought for such purpose as being bona fide and as having been created without the lienor having any notice that the motor vehicle was being used or was to be used for the commission of any offense or in violation of any statute or ordinance and shall pay the balance of such proceeds to the owner.

All liens against the property sold under the provision of this statute shall be transferred from the property to the proceeds of sale of the property. If, however, no one shall be found claiming the motor vehicle, the sale of the same, with a description thereof, shall be advertised in some newspaper having a circulation in the city and county once a week for two weeks and by handbills posted in three public places, and if no claimant shall appear within ten days after the last publication of the advertisement, the property shall be sold and the proceeds, after deducting expenses and costs, shall be paid to the State treasurer.

Under such a law, it is held, the authorities would be empowered to impound the cars and trucks of operators convicted of careless driving, put a police seal on them and place them in a public garage for a time named by the court. Such action, it is believed, would make drivers more careful.

The committee also learned that 106 daily newspapers in forty-seven States have agreed to cooperate in reporting contributing facts in automobile accidents. These reports will be invaluable, it is thought, in the committee's nationwide campaign to reduce the number of automobile accidents.

Applications for Paris Show Close on March 31

PARIS, March 1 (by mail)—Only one month is allowed for making application for space in the two Paris automobile shows, to be held from Oct. 2 to 12 and Oct. 22 to 31, for passenger cars and trucks respectively. The general regulations were published today and applications for space close on the evening of March 31.

For the passenger car show the stand rental is 500 francs per meter for first zone stands having an area of 80, 60 or 40 square meters. For the second zone the price is 400 francs, and for the third zone 300 francs. For the truck show the prices are considerably reduced. The show is under the management of Henri Cezanne, 51 Rue Pergolèse, Paris.

WILLYS-OVERLAND SHIPMENTS

TOLEDO, March 10—The Willys-Overland Co. established a new production record with February shipments of 22,136 Willys-Knight and Overland cars.

Casings Production Mounted in January

Inventories Were Also Greater Than in December, Although Shipments Gained

NEW YORK, March 12—Increase of production of pneumatic casings, inner tubes and solid tires during January is shown in the statistics compiled by the Rubber Association of America for the Bureau of Foreign and Domestic Commerce.

Inventories also were greater than in the preceding month, and while shipments of pneumatic casings increased, there was a falling off in shipments of inner tubes and solid tires. The statistics for the full year 1923 and for January of this year are as follows:

PNEUMATIC CASINGS

1923	No. Mfrs. Reporting	Inventory	Production	Shipments
January	62	4,695,916	3,127,270	2,994,297
February	60	5,224,387	3,217,987	2,588,639
March	58	5,670,601	3,855,726	3,322,637
April	56	6,088,272	3,539,326	2,976,160
May	57	6,906,594	3,659,986	2,757,764
June	55	7,040,660	2,956,943	2,502,185
July	54	6,471,124	1,992,989	2,539,425
August	58	6,058,387	2,355,915	2,807,432
September	60	5,397,557	2,029,581	2,623,775
October	59	4,376,352	2,361,340	2,819,583
November	55	4,689,329	2,299,725	2,456,296
December	57	4,329,300	2,437,148	2,603,617

1924	No. Mfrs. Reporting	Inventory	Production	Shipments
January	56	4,808,084	3,220,292	2,785,335

INNER TUBES

1923	No. Mfrs. Reporting	Inventory	Production	Shipments
January	62	5,838,310	3,951,885	3,748,651
February	60	6,771,958	4,039,202	3,001,697
March	57	7,740,945	4,875,414	3,828,315
April	55	8,394,184	4,259,558	3,535,635
May	57	9,292,223	4,317,537	3,414,115
June	54	8,924,326	3,590,011	3,581,060
July	52	7,527,281	2,666,354	3,942,247
August	53	6,950,578	3,577,922	4,304,034
September	55	6,457,455	3,254,575	3,683,574
October	55	6,898,425	4,855,244	3,595,737
November	53	6,693,639	3,451,716	3,422,426
December	52	6,318,446	3,288,665	3,497,472

1924	No. Mfrs. Reporting	Inventory	Production	Shipments
January	51	6,720,247	3,887,959	3,475,713

SOLID TIRES

1923	No. Mfrs. Reporting	Inventory	Production	Shipments
January	11	262,462	83,343	60,611
February	11	270,191	75,457	63,394
March	11	265,843	79,788	77,144
April	10	260,631	71,468	72,609
May	10	268,323	77,288	67,147
June	10	283,425	72,445	52,126
July	10	263,891	42,345	45,219
August	10	262,810	48,141	45,925
September	10	249,379	37,074	45,971
October	10	234,945	37,285	48,065
November	11	213,686	32,577	49,471
December	10	178,088	34,937	62,408

1924	No. Mfrs. Reporting	Inventory	Production	Shipments
January	10	182,782	53,604	43,375

Explanatory Notes

"Production" and "Shipment" figures cover the entire month for which each report is made. "Inventory" is reported as of the last day of each month.

"Inventory" includes tires and tubes constituting domestic stock in factory and in transit to, or at, warehouses, branches, (if any), or in possession of dealers on consignment basis, and as a total represents all tires and tubes still owned by manufacturers as a domestic stock.

"Shipment" includes only stock forwarded to a purchaser and does not include stock forwarded to a warehouse, branch, or on a consignment basis, or abroad.

Chevrolet Will Teach Retail Salesmanship

Work, in Charge of A. R. Kroh and C. W. Santee, Includes Correspondence Course

DETROIT, March 11—Chevrolet Motor Co. has undertaken a widespread campaign of retail salesman education which is intended to teach dealers and salesmen how to get maximum business results out of their respective territories. The step is taken in recognition of the need for more trained salesmen and is designed not only to make many more men available as salesmen to Chevrolet dealers, but to teach those already selling the line how to get best results.

Under the direction of C. E. Dawson, general sales executive of the company, two new divisions of the sales department have been organized. The first, the retail development division, will be under the direction of A. R. Kroh, the other, the educational division, under the direction of C. W. Santee. Both of these men are widely known in the industry through their connection with sales promotion work for the Goodyear Tire & Rubber Co.

Kroh to Organize Force

Mr. Kroh's work will continue along the line in which he is best known as a public speaker, along inspirational and sales promotion lines, with particular reference to the development of Chevrolet retail sales. He will organize a force to extend this work to all of the 7000 Chevrolet dealers and their retail selling organizations.

Mr. Santee, as head of the educational division will carry out the company's policy of building up its distributive program through education and information of retail salesmen, service men, dealers and the wholesale organization of the Chevrolet company. This work will be carried out by means of printed and illustrated correspondence courses, prepared especially by the Chevrolet company for its own use by means of fully equipped service schools maintained at all assembly plants and at Detroit headquarters and by the use of educational motion pictures.

Correspondence Course Planned

Local meetings addressed by members of Mr. Kroh's organization and by members of the factory organization present the means of setting the educational work actively into operation. Enrollment blanks in the correspondence course will be mailed at once to all Chevrolet dealers to be passed out to their salesmen and to men who are seeking to become salesmen. Fully 50 per cent more men are expected to be enrolled in the course than are now selling Chevrolets, and as these men are given diplomas they will be taken on as salesmen, adding that many more immediately to the retail organizations. The course will take about eight weeks

to complete. Salesmen and others taking it will pay \$5 each. It is expected that a large number of Chevrolet dealers will offer to refund this money as soon as the salesman receives his diploma, but the company will not permit the dealer to pay in advance for the course, as it is considered important to have the salesman have an actual investment in the course.

The parts into which the course has been divided include the following: "Why Study This Course," "Principles in Selling," "The Market for Automotive Transportation," "How a Chevrolet Operates," "General Selling Points of the Chevrolet," "Chevrolet Passenger Models," "Analyzing the Chevrolet Commercial Market," "Chevrolet Advertising," "Organizing Selling Effort," "How Purchases Are Financed," "Closing Sales," "What Is Back of Chevrolet" and "How to Earn Big Commissions."

Sunbeam-Talbot-Darracq Again Passes Dividend

LONDON, March 1 (by mail)—Although showing a net profit of £56,017 in 1922, S. T. D. Motors, Ltd., the proprietary company of the Sunbeam, Talbot, Darracq and other British and French interests, has again passed the dividend on its common stock, of which £1,394,608 has been issued in addition to £1,829,800 preferred. On the preferred a dividend of 3½ per cent has been declared.

The directors adopt an optimistic tone in their report and state that the 1924 output of the French plant is already sold. Conditions generally have improved, they declare, with every reason to anticipate that the improvement will be maintained.

The report of the London General Omnibus Co. for 1923 shows a small increase in traffic receipts (£7,655,413, against £7,501,425), but expenditure also increased and to a greater amount, resulting in the net receipts from traffic being lower than in 1922 by £31,022. Miscellaneous receipts make up for this and after placing £375,000 to reserve, there remains £322,258 available for dividends on the common stock. Nine per cent is to be paid.

Some of Ford Branches Handle Johansson Gages

POUGHKEEPSIE, N. Y., March 11—Johansson gages are now being marketed through some of the Ford branches. The Ford Motor Co. bought up the C. E. Johansson, Inc., with all the methods, processes and inventions of C. E. Johansson. More modern machinery has been installed in certain departments of the gage plant.

These changes have resulted in economies of manufacture that enabled a substantial reduction to be made in the price of many of the tools. Stocks are carried at branches in New York, Buffalo, Cleveland, Detroit, Chicago and Ford, Ontario. All dealer and jobber connections have been canceled.

Germany Favors End of Embargo on Cars

Viewpoint of Manufacturers Only Drawback—High Tariff Would Pacify Them

WASHINGTON, March 12—The embargo against automobile imports into Germany, which has been on for several years, will be lifted within a very short time, and a resumption of active automobile importing will be made, according to a prediction made by Trade Commissioner Arthur J. Grey at Berlin, in a lengthy report made to the Automotive Division of the Department of Commerce.

The present situation in Germany as regards automotive imports involves a three-sided controversy, indulged in by the automobile manufacturer in that country and the Association of German Automobile Dealers, comprising about half of the 2070 dealers in the country, and the automobile-using public.

Fear Higher Prices

The manufacturers, who oppose a relaxation or abolition of the import restrictions, declare that it will result in higher prices and extensive unemployment. The dealers take the position that the prohibition is harmful to all concerned, and in this contention they have the support of the German car-user.

In shutting out American cars, the prices of which range from one-third to three-quarters of the German cars of corresponding types and sizes, numerous potential consumers of low-priced cars are deprived of advantages arising from the use of motor vehicles.

The dealers declare that the presence of these cars in Germany would promote commerce in general and would change the present viewpoint that an automobile is a utility, available to all, and not a luxury, accessible only to a few. This is also the attitude of the public, the report states, which holds, with the dealers, that the popularization of the automobile will have a general energizing effect on German industry and commerce.

Tentative Agreement Reached

Public opinion is rapidly crystallizing in favor of lifting the embargo, and the Association of German Automobile Dealers has about concluded an agreement with the manufacturers' organization, which has tentatively agreed to withdraw its opposition, provided a high protective tariff is first assured.

No definite tariff schedule has as yet been worked out, but the dealer association has tentatively agreed to support a new tariff program, which will be based upon the weight of the imported car, and which would range from 50 to 86 per cent of the factory price of the imported car, if sold complete, and about 100 per cent if only the chassis is imported.

(Continued on page 648)

FINANCIAL NOTES

J. I. Case Threshing Machine Co. passed the quarterly dividend of 1½ per cent on the preferred stock, due April 1, claiming that although the company's profits from operation in 1923 were \$634,000 as against \$321,000 in 1922, in neither year was the annual requirement for the preferred, \$910,000, earned. The dividend was omitted to avoid impairing the company's surplus accumulated through the operation of previous years. Current assets the first of the year were approximately \$20,600,000, against current liabilities of less than \$5,900,000.

Graton & Knight Manufacturing Co. of Worcester, Mass., leather belting, reports an operating profit of \$269,000 in 1923. In 1922 the company reported a profit of \$14,000 and in 1921 a loss of \$4,865,000. It invested \$200,000 in plant improvement last year. The company now proposes a reduction in authorized capital, represented by 76,127 shares of no par common stock from \$2,000,000 to \$200,000, the reduction to be effected by transferring a stated amount from the capital account to profit and loss surplus.

Eaton Axle & Spring Co. reports net profits for the last year of \$369,927. Total income was \$654,927, including a net credit of \$285,000 which was added to income through the purchase of the Cox bumper interests. Dividends paid and provided for, including that paid Jan. 1, 1924, were \$441,155, leaving \$213,772 added to surplus. Current assets were \$3,015,571 and current liabilities \$776,764.

American Chain Co. has declared a dividend of 50 cents a share on the common stock, payable March 26 to stockholders of record March 15. An initial dividend of \$1.50 a share was paid on Jan. 2, 1924. The regular quarterly dividend of 50 cents a share was also declared on the Class A stock, payable March 31 to stockholders of record March 21.

Hudson Motor Car Co. has called a special meeting of stockholders for March 31 to consider an increase in the company's capital stock from 1,200,000 to 2,000,000 shares. The proposed increase is to secure wider distribution of the stock. It is said that the company plans to continue the payment of the annual dividend of \$3 a share.

Mack Trucks, Inc., has decided to increase its authorized capital stock from 320,000 to 500,000 shares. The increased stock, it is understood, will be held in the company's treasury for future needs and that the company plans to enlarge its plant and service station facilities.

Tri-City Malleable Castings Co. of East Moline, Ill., has certified to the secretary of state to an increase in capital stock from \$300,000 to \$350,000. H. C. Smith, president, and E. M. Richardson, secretary, explain this is necessary to meet the expansion of business.

Bassick Alemitte Co. has declared an extra dividend of 25 cents a share on the common, besides the regular quarterly dividend of 50 cents a share. Both dividends are payable April 1 to stockholders of record March 20.

Chandler Motor Car Co. has declared the quarterly dividend of \$1.50 a share.

AUTO BODY ELECTS OFFICERS

DETROIT, March 12—The officers of the Auto Body Co. of Lansing have been elected as follows: Frank N. Arbaugh, president; Harris E. Thomas, vice-presi-

dent; J. Edward Roe, treasurer; W. V. C. Jackson, vice-president and general manager; John C. Moore, secretary and assistant treasurer, and B. B. Dix, assistant secretary. The board of directors of the company, all of whom were re-elected at a recent meeting, comprises the first four officers and John W. Haarer, A. C. Stebbins, Edward S. Porter, Richard Price, Clarence E. Bement and Fred C. Ruch.

White Statement Shows \$6,964,665 Net Profit

CLEVELAND, March 13—Following its preliminary report a few weeks ago, the White Motor Co. has issued its annual statement for 1923, which reports gross sales of \$48,876,606, an increase of \$11,608,380. Net profits amounted to \$6,964,665, out of which came \$2,000,000 for dividends. This leaves a balance of \$4,964,665 for surplus, which is increased to \$9,425,739 slightly larger than in 1920.

Notes payable for borrowed money were reduced from \$2,000,000 in 1922 to \$1,000,000, while at the end of the year cash stood at \$2,347,491 and notes receivable at \$9,749,320. The ratio of current assets to current liabilities is 6 to 1.

The value of finished trucks, finished parts, materials in process, and raw materials and supplies was placed at \$14,668,038 at the end of the year, an increase of \$3,527,532 over 1922.

Additions of \$682,808 were made to the company's capital account during the year, in which is included plant expansion at Cleveland.

German Dealers Coming to Transport Congress

NEW YORK, March 13—A delegation of six or eight German automobile dealers will attend the World Motor Transport Congress, to be held by the N. A. C. C. in Detroit in May. This was stated today by George F. Bauer, secretary of the foreign trade committee of the Chamber, after the receipt of advices from the Deutscher Automobil Haendler-Verband (German Automobile Dealers Association) of Berlin.

The party will reach New York about May 1 for an extended investigation of the American industry and, according to the information received by Mr. Bauer, it is expected that Germany will make large importations of American automobiles after the present German-American commercial treaty has been ratified. Many inquiries from German dealers have been received recently by automobile exporters here.

CONTINENTAL MOTORS' MEETING

DETROIT, March 12—A special meeting of stockholders of the Continental Motors Corp. has been called for March 28 at Richmond, Va., to act upon a proposal to authorize an issue of fifteen-year first mortgage sinking fund 6½ per cent gold bonds, not to exceed \$10,000,000, the payment to be secured by a mortgage or deed of trust upon the corporation's entire real property.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

Irregularity is still the main feature of the business situation. Although trade in most lines is large, there is a general disposition to avoid forward buying. No changes of general significance were observed last week, both prices and trade movements being substantially unaltered.

Production of pig iron in February totaled 3,074,757 tons, comparing with 3,018,890 in January and 2,994,187 in February, 1923. The average daily output of 106,026 tons compared with 97,384 in January and 106,935 a year ago. The production of steel ingots amounted to 3,780,663 tons, as against 3,599,938 in January and 3,454,918 in February last year, while the daily average of 151,227 tons compared with 133,331 in the preceding month and 143,955 a year ago.

The steel output last month was the largest since May, 1923, when the peak of 4,195,800 tons was reached. Unfilled orders on the books of the United States Steel Corp. at the end of February amounted to 4,912,901 tons, comparing with 4,798,429 a month before and 7,283,989 last year.

General advances in the prices of crude petroleum in various sections of the country have been announced this week. It is stated that production has declined and consumption and export increased to such a degree that accumulated stocks were depleted during February at the rate of about 50,000 barrels a day—a situation unusual at this season of the year.

Discounts by Federal Reserve banks declined \$43,300,000 during the week ended March 5, a decline of \$51,600,000 in bills secured by Government obligations being partially offset by an increase of \$8,300,000 in "other bills discounted."

Loans of reporting member banks declined \$52,000,000 during the week ended Feb. 27, most of the drop being in loans secured by stocks and bonds. Investments increased \$1,000,000 and borrowings from Reserve banks \$27,000,000, while net demand deposits declined \$70,000,000.

Call money was easy throughout last week, 4½ per cent being the prevailing rate. Time loan rates were unchanged at 4½ to 5 per cent.

Doehler Die Casting Acquires Two Plants

NEW YORK, March 13—The Doehler Die Casting Co. of Brooklyn announces the acquisition of two plants, one at Batavia, N. Y., and the other at Pottstown, Pa.

The latter was the die casting department of the Light Manufacturing & Foundry Co., which will be operated as the Light Manufacturing & Foundry division of the Doehler company, specializing in the production of zinc alloy die castings. The Batavia plant will produce aluminum die castings.

Indiana Engineers Discuss Manifolds

Carburetor Research Work Also Forms Basis of Discussion of S. A. E. Section

INDIANAPOLIS, March 10 — The March meeting of the Indiana Section of the Society of Automotive Engineers, held last week, heard papers setting forth results of research work on manifolds and carburetors. H. W. Asire, research engineer of the General Motors Research Corp. of Dayton, in presenting one of the papers, said that present day manifolds must distribute liquids as well as gases.

By the use of separators between carburetor and engine and, in another experiment with a separator placed beyond the cylinder of the experimental machine, Mr. Asire was able to collect 50 per cent of liquid. Through studies of air flow and photographs of transparent manifolds, he showed also the uneven distribution to various cylinders with different types of manifolds.

Public Wants "Performance"

O. C. Berry, chief engineer of the Wheeler-Schebler Carburetor Co. and vice-chairman of the section, showed that although better economy is possible through proper carburetors and carburetor settings, this is not what car makers and the public demand. Unfortunately what the public demands involves a wasteful use of gasoline to obtain the desired "performance" standards, which are popular. As long as such standards prevail, waste of fuel will continue, he said, but this is not the fault of the designers, who would like to see better economy obtained.

F. C. Mock, research engineer of the Stromberg Motor Devices Co., gave added facts confirming what Mr. Asire's research had proved.

Comparative results obtained from use of heated and cold manifolds in experimental runs were presented by W. B. Barnes of the Schebler engineering department. He said that it seems to be almost impossible to over-heat a manifold if good performance of engines and cars in regular work is desired, rather than high power curves in laboratory tests.

The nominating committee of the section reported through its chairman, W. G. Wall, that, in view of the unusual success of the section meetings this year, it advised that the present officers be continued another year. F. F. Chandler, Ross Gear & Tool Co., is chairman; O. C. Berry, vice-chairman; D. C. Teeter, treasurer, and G. T. Briggs, secretary. The election will be held at the regular meeting, April 3.

Annual Meeting in Buffalo

BUFFALO, N. Y., March 11—The annual banquet of the Buffalo Section of the Society of Automotive Engineers was held last night and was attended by more than seventy-five members and guests.

L. H. Pomeroy, acting as toastmaster, spoke strongly in favor of more attention being given to the young engineers and stated that section meetings should have as one of their objectives the developing of the sales instinct in the engineer.

David Beecroft, past president of the society, speaking on the subject of transportation, stressed the necessity of young engineers making a greater study of the operation and maintenance of motor vehicles, particularly of buses and trucks, in order to have the operator's viewpoint more strongly in mind in considering questions of design.

As the number of vehicles in use increases, Mr. Beecroft said, problems of maintenance take on greater importance. He declared that more attention to the question of maintenance, accessibility, and design of parts must be given by the engineer, and his vision must extend beyond the four walls of the factory.

M. E. Forbes, president of the Pierce-Arrow Motor Car Co., a guest of the evening, and L. C. Hill, assistant general manager of the S. A. E., New York City, spoke on sectional activities.

Washington Section Nominates Officers

WASHINGTON, March 8—At the monthly meeting of the Washington Section of the Society of Automotive Engineers, held here last night, the following officers were nominated for the coming year: Chairman, A. W. Herrington, chief engineer, Engineering and Design Section, Motor Transport Division, Q. M. C., U. S. A.; vice-chairman, C. H. Warrington, president, Warrington Motor Car Co., and secretary-treasurer, Conrad H. Young, engineering representative, Armstrong Cork Co. All of the nominees are now officers of the section.

It was announced that the next meeting of the section will be held on April 4, when A. W. Herrington will present a paper entitled "Recent Developments in Motor Vehicles," dealing in particular with the subject of accessibility.

(An account of the brake demonstration staged in connection with this meeting and the paper on brake tests presented by W. S. James of the Bureau of Standards is given on another page of this issue.)

INDUSTRIAL NOTES

Halowax Corp., as a division of the Bakelite Corp., will assume the production and sale of Halowax, synthetic oils and waxes, formerly conducted by the Condensite Co. of America. The work will be under the direction, as president, of Sanford Brown, who also is director of engineering service of the Bakelite Corp. Large stocks will be carried at Wyandotte and small stocks at Bloomfield, N. J.

Gill Storage Battery Co. of San Bernardino, Cal., has taken possession of its new factory. It plans on doubling its output this year. The old plant was damaged by fire in December and since then the company has been in a temporary plant.

METAL MARKETS

Developments in the market for steel products during the closing fortnight of the current quarter will be watched with more than ordinary interest. It would be exaggerating the state of affairs to say that a critical stage has been reached, but, unless consumers' buying appetite improves in the next two weeks, there will be many a disconcerting gap in second-quarter order books. As has been frequently emphasized, full-finished automobile sheets form an exception from this condition. Mills rolling this specialty have a sufficient backlog of orders on hand to relieve them from anxiety over operating schedules until late in May, and in some cases until midsummer.

They can not, however, escape altogether the untoward effect on all steel products of market conditions in general, although the non-integrated sheet rollers benefit to some extent from the very easy conditions surrounding the supply of their raw material, i.e., sheet bars. Contracts for the latter carry clauses affording protection to buyers in the event of declines, and those who prefer to take their chances in the open market intimate that they are able to shade heretofore prevailing quotations. Price-shading in sheets, other than the full-finished kind, continues to be reported, but is not so much the result of intensive competition for available business as in the nature of reprisals.

Producers who adhered to the generally prevailing quotations in January and February found some of the business which they had counted on going to competitors who undersold them \$1 or \$2 a ton. They are not taking any chances now and have taken to price shading themselves. On the other hand, some of the mills that made concessions came to the conclusion that the business would have come to them just as easily at full prices, and they are not quite so eager now to sacrifice part of their profits.

It is well enough for Wall Street to grow enthusiastic over a 13½ per cent increase in the theoretical steel ingot production in February, but in the absence of all positive information as to how much or how little of this steel has passed into actual consumption, it may denote nothing more than that the rate of production has overreached the rate of absorption—a negative rather than a constructive market factor. The automotive industries continue to play close to the cushion, commitments for steel products preceding by but a few weeks actual requirements, but for all that automotive steel consumption is the one bright spot in the otherwise dismal market.

Pig Iron.—Blast furnace interests, after having let go of some tonnages of foundry iron at prices dictated by the buyers, are now endeavoring to secure slightly higher figures for what tonnages melters are disposed to take on.

Aluminum.—Norwegian shipments of ingots to the sole domestic producer have become so impressive of late that one wonders why that interest was so eager for the sharp increase in the tariff on ingot metal provided by the Fordney-McCumber Act, when it is not only the sole American producer, but also the heaviest importer of ingots. The leading interest is understood to be asking 1 cent a pound more for ingots. Sheet prices are reported as unchanged.

Copper.—Copper and brass products rule firm at the higher levels that followed the recent advance in the red metal.

Calendar

SHOWS

- Jan. 3-10—New York, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Bronx Armory.
- Jan. 24-31—Chicago, National Automobile Show, under the auspices of the National Automobile Chamber of Commerce, Coliseum and First Regiment Armory.

FOREIGN SHOWS

- March 14-23—Geneva, International Motor Exhibition, under the auspices of La Chambre Syndicale Sulesse de l'Industrie Automobile.
- April 2-13—Barcelona, Automobile Exposition, under the auspices of the Confederacion de Camaras Sindicales Espanolas del Automovillismo y Ciellismo, Palacio de Arte Moderno.
- April 6-April 27—Rosario, Argentina, under the auspices of the Automovil Club Argentino.
- April 8-22—Milan, Annual Automobile Show, Sports Palace.
- April 16-21—Johannesburg, South Africa, Witwatersrand Motor and Agricultural Show.
- May 10-20—Madrid, Annual Automobile Show, under the auspices of the National Association of Automobile

bile Importers, Palacio del Helo y del Automovil.

- Aug. 23-Sept. 6—Toronto, Ont., National Automobile Show in conjunction with the Canadian National Exhibition under the sanction of the Canadian Automotive Equipment Association and the Automotive Industries of Canada.
- Oct. 2-12—Paris, passenger cars, motor cycles, bicycles and accessories, Grand Palais.
- Oct. 17-25—London, Annual Passenger Car Show, Olympia.
- Oct. 22-31—Paris, motor trucks, stationary engines, garage tools and machine tools, Grand Palais.

RACES

- April 24—Fresno.
- April 27—Trapani, Italy, International Automobile Race.
- May 30—Indianapolis.
- June 14—Altoona.
- July 4—Kansas City.
- Aug. 3—Lyons, France, European Grand Prix.
- Sept. 1—Altoona.
- Sept. 1—Syracuse.
- Oct. 4—Fresno.
- Oct. 19—Kansas City.
- Nov. 24—Los Angeles.

CONVENTIONS

- March 31-April 4—New Orleans, Annual Spring Meeting of the Automotive Equipment Association.
- May 19-22—Detroit, National Automotive Service Convention and Maintenance Equipment Show, under the auspices of the Service Division of the National Automobile Chamber of Commerce, General Motors Building.
- May 21-24—Detroit, International Motor Transport Congress under the auspices of the National Automobile Chamber of Commerce.
- June 3-4—Detroit, Midsummer Meeting of the Automobile Body Builders Association, Hotel Statler.
- June—Washington, Pan American Highway Congress, under the auspices of the Pan American Highway Mission.
- Sept. 22-26—Boston, Sixth Convention and International Steel Exposition of the American Society for Steel Treating.
- S. A. E. MEETINGS
- March 17—Cleveland Section, Traffic Control, Major Mark Ireland, Cleveland Hotel, Cleveland, 8 p. m. Dinner. 6.30 p. m.

- March 20—Detroit Section, Recent Developments in Permanent Mold Castings, D. H. Meloche, General Motors Building, Detroit, 8 p. m. Dinner, 6.30 p. m.
- April 2—Milwaukee Section, The Future Passenger Car, C. W. Pendock, chief engineer, Le Roi Co.
- April 3—Detroit Section, Chassis Lubrication, F. H. Gleason, General Motors Building, Detroit, 8 p. m. Dinner, 6.30 p. m.
- April 15—New England Section, Road Illumination, R. E. Carlson, Engineers Club, Boston, 8 p. m. Dinner, 6.45 p. m.
- April 17—Metropolitan Section, Fleet Maintenance, F. Winchester.
- May—S. A. E. Motor Transport Session, New York City.
- May 15—Metropolitan Section, What Roads and Steels Do to Automobiles.
- June 24-27—Summer Meeting of the S. A. E., Spring Lake, N. J.
- Oct. 21-24—S. A. E. Production Meeting, Detroit.
- Nov. 18-19—Joint Service Meeting of the S. A. E. with the N. A. C. C. Cleveland.
- Aeronautical Meeting at Dayton at the time of the Pulitzer Races.
- January—S. A. E. Annual Meeting, Detroit.

Germany Favors End of Embargo on Cars

(Continued from page 645)

Despite conditions in Germany since the war, there have been some importations of foreign automobiles, but not of American make. The import prohibition went into effect Jan. 16, 1917. The principal imports since that time have been from Austria, Italy and an unknown number of vehicles which were smuggled into the country without the payment of any duty at all.

The number brought into the country in an irregular way is not known, but has grown to such proportions since the Ruhr occupation began that the occupied area has become known as "the hole in the west," where hundreds of cars have been smuggled in.

In discussing the outlook for the immediate future, Commissioner Grey says:

With important changes in the situation imminent, American manufacturers who desire to enter the German market at the time when it opens for business should give immediate and careful attention to their plans. The choice of dealers, negotiations, payments and special requirements should be studied in the light of the unusual conditions now prevailing in Germany.

In the choice of foreign cars there is a decided preference for American makes, partly because of the lower prices and a greater variety of styles, and partly because of a friendlier national feeling. Practically all of the 2000 established dealers in Germany are open for American agencies, as only half of them now represent German cars and their contracts permit the selling of any make of cars not in competition with the lines represented.

Prices of automobiles in Germany have increased materially because, where currency is accepted in payment for cars it must be on the basis of the gold mark (M 4.20 to \$1). The average price of a German automobile in July, 1914, was 5885 gold marks, or about \$1,400. On Nov. 1, 1923, the price had increased to 12,050 gold marks, about \$2,869.

NEW PLANT OF McQUAY-NORRIS

ST. LOUIS, March 10—The McQuay-Norris Manufacturing Co. will open its new piston pin plant at Connersville, Ind., which will double its present output, about April 1. More than \$60,000 is being spent on this building and its equipment. The present plant has been operating on a night and day basis for several weeks to increase production sufficiently to meet orders.

GETS JUHASZ FOREIGN RIGHTS

NEW YORK, March 10—John Juhasz, president of the Juhasz Carbureter Corp., has returned from a trip to Europe, where he sold the European manufacturing rights of the Juhasz carbureter to the Juhasz Vergaser Akt. Ges., of Hanover, Germany.

SHORB HEADS DECATUR PUMP

DECATUR, ILL., March 10—Stockholders of the Decatur Pump Co., at their annual election, named directors as follows: W. C. Field, W. A. Shorb, J. D. Johnson, A. W. Burks, E. B. Keusink and W. L. Waddell. The board organized with Mr. Shorb, president; Mr. Burks, vice-president and general manager, and Mr. Waddell, secretary-treasurer.

Great Lakes Service Gets Bigger Vessels

DETROIT, March 10—Greater facilities for automobile transportation by boat over the Great Lakes are promised with the introduction of the two new steamers, the Greater Detroit and Greater Buffalo, into the Buffalo service June 1 to 15. The boats will become part of the Detroit-Cleveland Navigation Co. fleet, displacing the two former boats on the Buffalo run, which will become the regular Cleveland run boats. The Cleveland boats in turn will be shifted to a new run to Chicago which, however, will not become operative until next year.

The two new boats to Buffalo will have capacity for about 150 cars each, an increase of fifty over the carrying space of the former boats. The boats placed on the Cleveland run will carry about 100 cars each, which, with the other boats continuing on that service, will give an increased capacity of about 70 per cent.

The Buffalo and Cleveland service is on a daily basis between the two cities. When the Chicago service is started there will be capacity for about sixty automobiles. Two ships will be operated over this route, making three trips weekly with only one stop at Mackinac Island. The sailing time on the Chicago route will be thirty-six hours.

Three other boats which have been operated by the company will be sold, according to present plans. As they are also of a type for carrying automobiles as well as passengers they will be continued undoubtedly in lake service.